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EXERCISES

IN

WOOD-WORKING

FOR

HANDICRAFT CLASSES

IN

ELEMENTARY AND TECHNICAL SCHOOLS

10-29-97 A08:20 IN

BY

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MEMB. INST. C.E.

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EXERCISES IN WOOD-WORKING

FOR

HANDICRAFT CLASSES.

ATTEMPTS are now being made in various directions to establish schools for elementary instruction in handicraft. In most cases at present a handicraft class, attached to a primary or secondary school, or forming part of one of the colleges in which partly scientific, partly technical instruction is provided, takes the form of a carpenter's or joiner's shop, and instruction is given in wood-working. There are, no doubt, good reasons for this selection, the tools being comparatively inexpensive, the materials used cheap and easy to work, and teaching assistance not difficult to obtain.

In making arrangements for the establishment of a class for the instruction of elementary school teachers in wood-working, at the Central Institute of the City and Guilds of London, the author had to consider what kind of exercises were most suitable for such a class, and in what way those exercises could be systematised, so as to render the instruction of a more or less considerable class by a single teacher possible. The first and governing condition in choosing exercises for such a class is the extremely limited time which the pupils can afford for this special instruction. An ordinary apprentice to a trade works continuously all day long and every day, and he may undertake work of some size and complexity with a certainty of finishing it in a reasonable period of time. But the pupil of a handicraft class is in a very different position. He probably has no knowledge to begin with of the use of tools, so that he works slowly and fumblingly, and he is liable to spoil his work at any stage of its progress. It is desirable, therefore, that the exercises set for him should be so simple as to involve only one or two difficulties at a time. Then, probably, he works only for two and a half or three hours once or twice in the week. If the exercises are not very limited in the amount of labour required, they occupy an interminable time before they are finished.

It appeared to the author, therefore, that exercises, at all events at first, should consist of very limited portions of construction, and that they might often take the form of models of larger constructions.

The object of the handicraft class is not so much to teach joinery and carpentry as to fit the lads for entering on any employment involving the skilled use of the hands. Now, whatever else is important in that case, nothing is more important than that they should learn to work to dimensions given. To do this in any effective way they must be able to work to a drawing, and the value of a handicraft class in a school will be doubled if there is also instruction in drawing. The class for drawing will enable a pupil to understand easily what work he is to do, and the comparison of drawing and work in the workshop will show him, better than any amount of verbal instruction in school, the object and reason of the methods of the drawing class.

It appeared to the author, therefore, that he could not better facilitate the work

of a class for elementary instruction in handicraft, than by preparing a set of drawings of suitable pieces of work for such a class. The following drawings form a series of graduated exercises. They begin with small, simple pieces of jointing, in which, as only a single pair of pieces are united, the labour and difficulty are reduced to a minimum. When a selection of these joints has been made the pupil will understand how pieces of wood are united together, in what directions pieces so united resist separation, and what is the relative labour of making each kind of joint. The next series of exercises consist of simple frames of four joints; the difficulty here is a good deal greater, because each joint must not only be accurately formed, but must have the proper position in relation to the rest. Some exercises of slightly greater difficulty are also added.

For various reasons it appeared to the author that some simple exercises in pattern-making would be very suitable for a handicraft class.

Many handicraft classes appear to have been provided with a wood-turning lathe. This kind of work does not seem to the author the most important, really good wood-turning requiring quite special skill and at the same time having a limited application in the arts. Some simple exercises in wood-turning are, however, included.

It is not the author's idea that any one pupil should make all the joints here illustrated. But if different exercises are selected for different pupils working in the same class, the general amount of information diffused will be increased, and the work being more various will be more interesting.

The drawings were made from the author's sketches by Mr. A. Sharp.

CARPENTRY AND JOINERY.

Carpentry properly includes all modes of working wood except turning. But it is convenient to call the making of structural woodwork, such as floors and roofs, carpentry, and the making of smaller articles of use, joinery. Cabinet-making is joinery applied to making articles intended to be ornamental as well as useful. Pattern-making is joinery applied to making the special 'patterns' of things which are to be cast in iron, for the purposes of the engineer.

The woods used ordinarily by the carpenter and joiner are roughly divided into 'soft' wood and 'hard' wood. The division is, for most purposes, nearly the same as that of 'pine wood,' derived from cone-bearing, needle-leaved trees, and 'leaf wood,' derived from other broad-leaved timber trees. Pine wood is generally soft, straight grained, easily worked, and obtainable in large sizes. The carpenter uses chiefly 'yellow deal,' the produce of the red pine or Scotch fir, and 'white deal,' the produce of the spruce fir. The pattern-maker uses American 'yellow pine,' which is often little distinguishable from yellow deal. Pitch pine is a harder and more resinous timber, much used by the joiner and cabinetmaker.

For most class exercises 'yellow deal' or 'yellow pine' is most suitable. For some of the smaller exercises a very even-grained wood like lime or American bass wood is suitable, or sycamore or beech, which are harder, may be used, if the learner has patience and wishes to make nice work. Honduras mahogany or pear wood might be used for small exercises, and would bear finer cutting than pine wood.

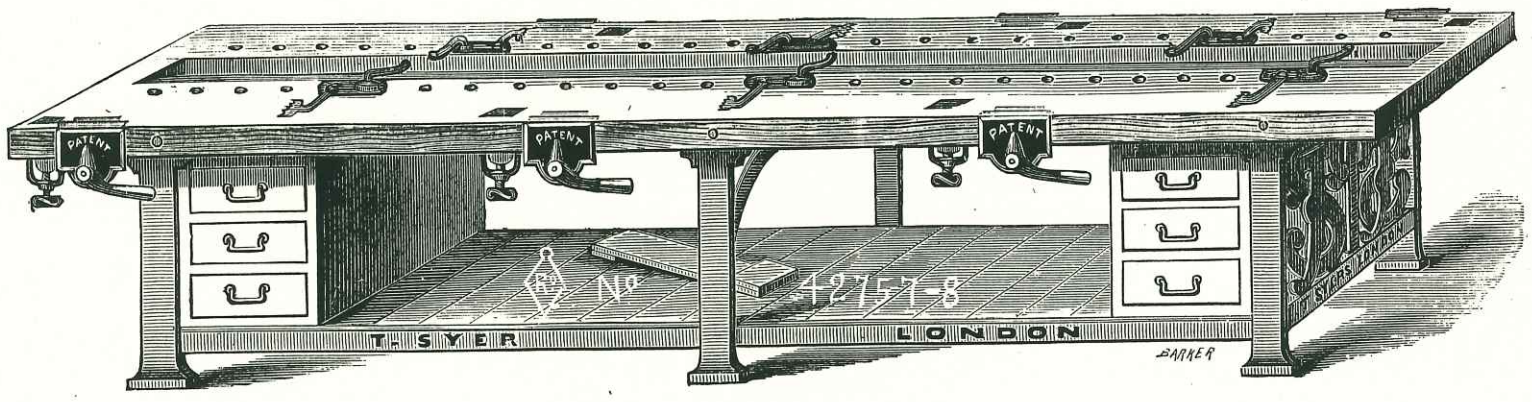
Alder, lime, basswood, or sycamore, are perhaps the best woods to begin with for turning. Box wood and pear wood are also suitable and are harder. Many special woods of beautiful colour or graining are also obtainable, but these are too hard for beginners, and require different tools.

The Bench.—The bench at which a carpenter works must be strong and firm. It is provided with a vice and bench-stop, and an iron cramp, called a 'holdfast,'

fitting into holes in the bench is also useful. The bench is most commonly made of white deal, and the ordinary vice is a wood vice with wood screw. One or two sawing stops are also required.

In a handicraft school, where a number of pupils have to be employed simultaneously in the least space practicable for working, it is necessary to provide for several pupils working at one bench. A very convenient arrangement is that shown in the woodcut, which is made by Messrs. Syers, of Finsbury Street, London, and called by them a 'multiple bench.'

This bench, about fourteen feet long, can be arranged for six pupils. It has iron standards and iron instantaneous-grip vices, which take less room and are stronger than ordinary wood-screw vices. This bench costs about 20*l*. The bench shown has two nests of drawers for tools. Where a set of tools is used in turn by all the pupils employed at the bench these may be useful. But if, as is desirable, each pupil has tools of his own, a more extensive set of lockers somewhat larger than these drawers is necessary. Such a nest of lockers may be built against the wall of the shop at no great expense. The bench shown is no doubt somewhat more expensive than an ordinary bench with wood vices, but it is also stronger and firmer.



It is convenient to have in the shop for common use a mitreing board, a shuteing board, one or two mitreing blocks, a straight-edge or two, and two or three pairs of trueing sticks.

Grindstone.—A good serviceable grindstone about twenty-four inches diameter and four inches width of face is indispensable. This is generally mounted on an iron frame and worked by the foot.

Glue-pot.—A glue-pot for general use is also necessary. This is most conveniently arranged on an iron shelf with a Fletcher's solid flame burner for heating.

A nest of drawers with an assortment of nails and screws is required.

Tools.—In selecting a set of tools for use in a handicraft class, three points should be borne in mind. The space for each pupil is somewhat limited, the work is smaller and less various than average joiner's work, and the tools most suitable for the practised strength of a joiner are somewhat beyond the powers of a pupil. The following is a list of the most essential tools required by each pupil for ordinary carpentry and joinery. The set costs about 26*s*. to 28*s*. :—

1 plane, seventeen inches long, ground more like a trying plane than a jack plane
1 smoothing plane
14-inch tenon saw
8 firmer chisels
1 $4\frac{1}{2}$-inch rosewood square
1 2-foot rule
1 medium-sized hammer
1 marking gauge
1 screw-driver
3 gimlets, 3 bradawls, 1 bradpunch
1 marking-point
1 spokeshave

In order that these may suffice for a class of about twenty-five, the following tools, which will not be much injured by use, should also be provided :—

3 mallets
3 24-inch panel saws
3 oilstones and oil-can
1 joiner's cramp
1 set of $\frac{1}{8}$-inch letters for marking tools
2 sawing trestles

WOOD-TURNING.

Wood-turning seems to the author to be in itself the least useful kind of work for an elementary handicraft school, but a lathe has, it appears, generally been introduced. No doubt using a machine like a lathe is interesting to lads, and as a first introduction to machinery it probably is instructive. If a wood-turning foot-lathe is obtained, it should not be too small or light. A good solid wood frame on iron standards, with one or two sets of 6-inch or 7-inch headstocks, seems the most suitable. If two sets of headstocks are provided, the bed may be twelve to fifteen feet long. Each set of headstocks should be provided with a hand-rest with two tees, a face-plate, and a prong-chuck. A tool-rack and tray is also necessary at the back of the lathe. Two lathes of this kind may cost about 30*l*. The tools required will be a one-inch long turning-chisel and one-inch long gouge, five ordinary chisels and five gouges, one scriber, one pair of spring dividers, one pair of ordinary in and out callipers, a wing compass, a Washita oilstone, some Washita gouge slips and oil-can. Lathes are supplied by Mr. J. H. Evans, of Wardour Street; Mr. Syers, of Finsbury Street; Mr. Buck, of Holborn Viaduct; and other makers.

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LIST OF DRAWINGS.

1. SAWING.

   In addition to the simple exercises shown, a beginner may be set to make a series of parallel saw-cuts with and across the grain, of uniform depth, in any waste piece of wood.

2. PLANING.

   The objects are first to learn how to get a plane surface and test it with the edge of the square or trueing-stick; next how to get a set of plane surfaces at right angles

3. MORTISE AND TENON JOINTS.

4. END JOINTS. SCARPH.

5. HALVING.

6. OBLIQUE MORTISE AND TENON. HALVING.

7. JOINTS AT RIGHT ANGLES.

8. DOVETAILS.

9. JOINING BOARDS. TONGUE AND GROOVE. DOWELS. CLAMPS. FRAMED PANEL.

10. DOVETAILED FRAME.

11. SIMPLE FRAMING.

12. TENONED AND HALVED FRAMES.

13. MITRED FRAME.

14. FRAME WITH SLANTING SIDES DOVETAILED.

15, 16, 17, 18, 19. WOOD TURNING.

20. PATTERN MAKING. WHEEL ARMS.

21. PATTERN OF SMALL BRACKET.

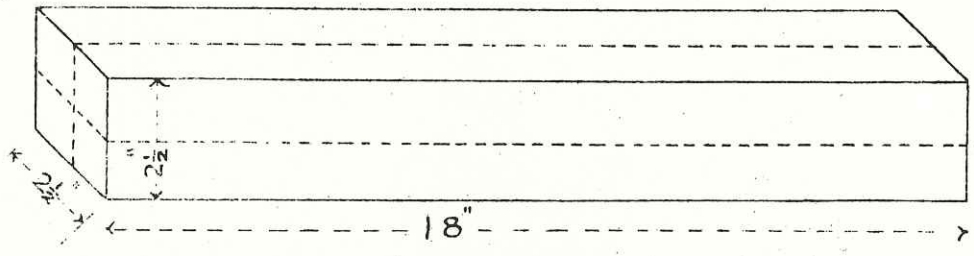
22. PATTERN OF CHAIN PULLEY.

23, 24. COMMON PUMP BUCKET AND PATTERN.

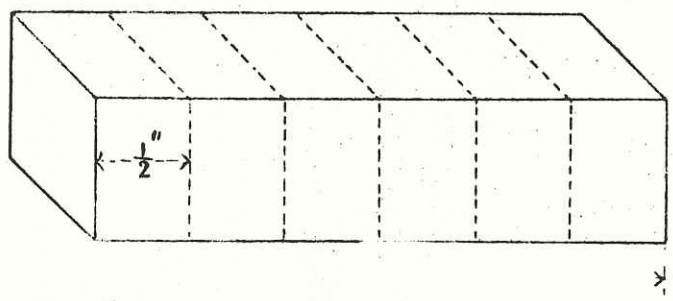
25, 26, 27, 28. SMALL ENGINE CYLINDER. DRAWINGS OF PATTERNS AND CORE BOXES.

Drawing No. 1

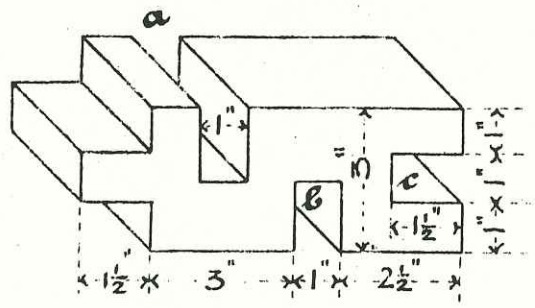
Sawing.



Cut a piece of rough wood of about the dimensions shewn. into four parts, by saw cuts along the dotted lines. Examine the pieces to see if the angles are nearly square and the sides straight.



Cut a piece of 3" square timber into slices examining afterwards if they are equally and squarely cut.

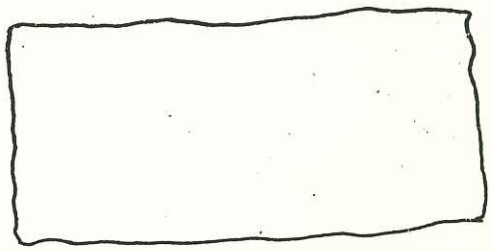


Cut a piece of 3" square timber with the saw as shewn. After sawing cut out the parts a b c with the chisel, and examine if the saw cuts are parallel.

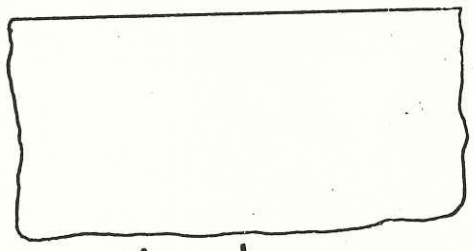
HANHART LITH.

Drawing No. 2.

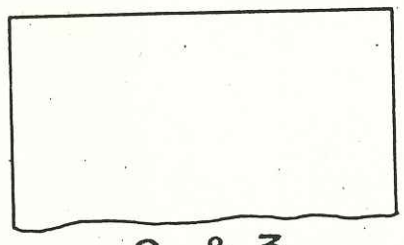
Planing.



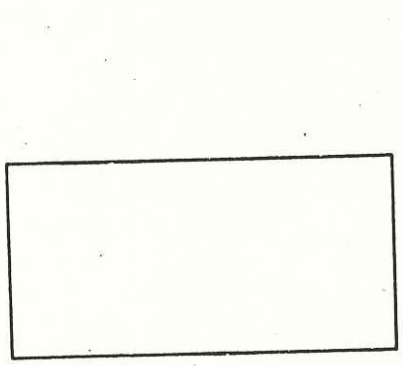
Sawn Block

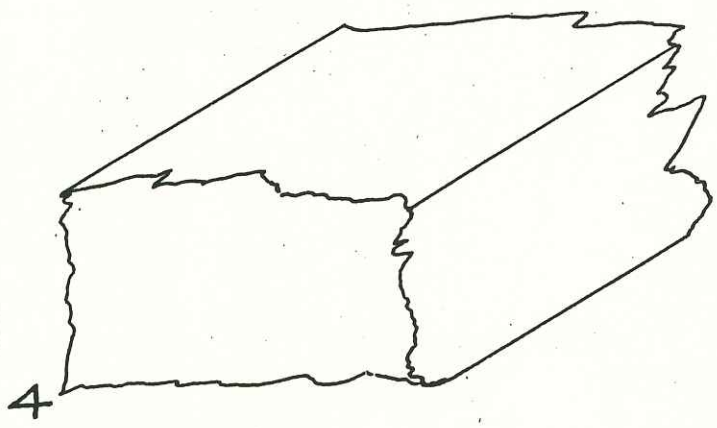


Side 1



2 & 3





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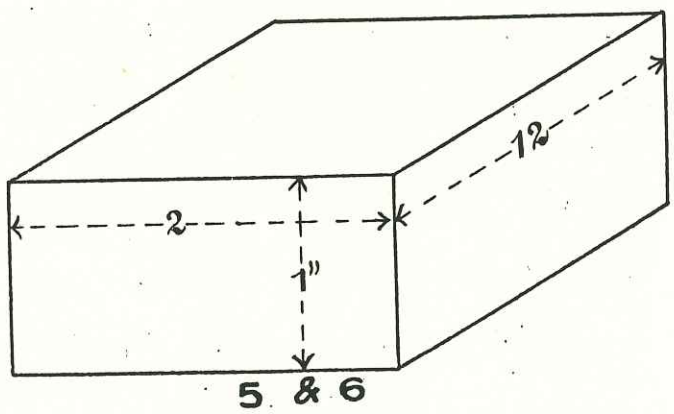


5 & 6

Plane up a rough piece of wood

to 12" x 2" x 1"

or 24" x 2½" x 1"

HANHART LITH.

Drawing No. 3.

Simple Joints.

Mortice & Tenon.

Fig. 1.

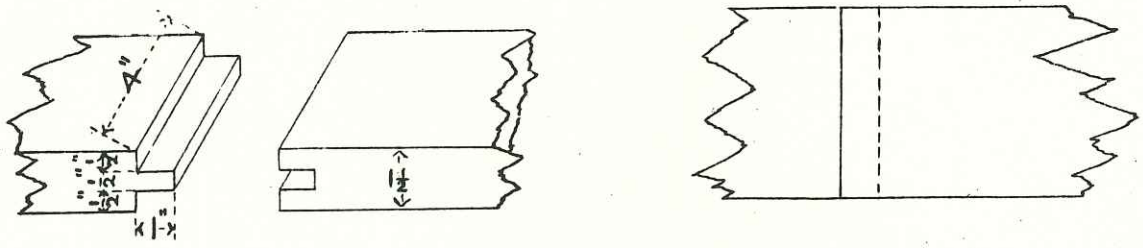


Fig. 2.

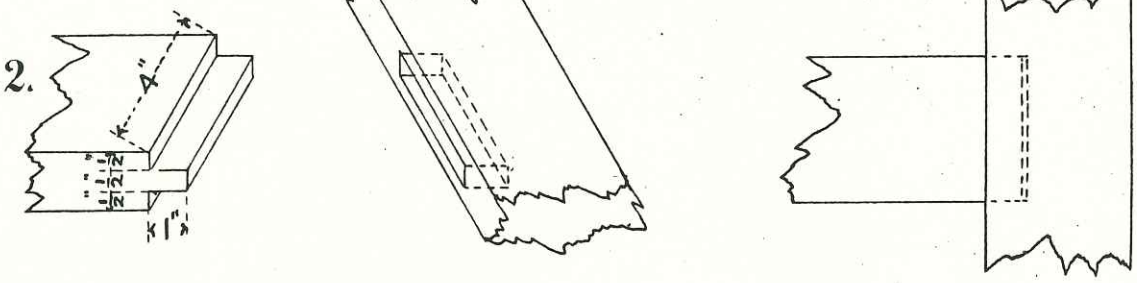


Fig. 3.

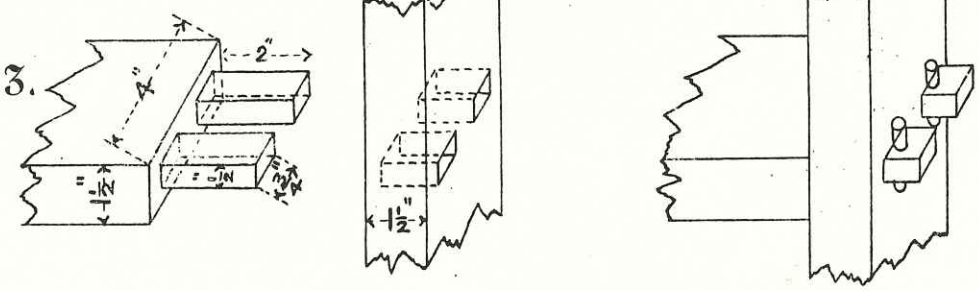
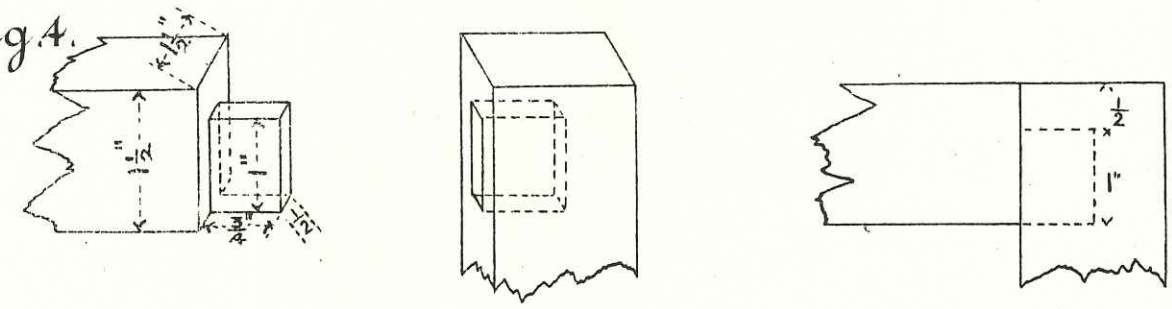


Fig. 4.



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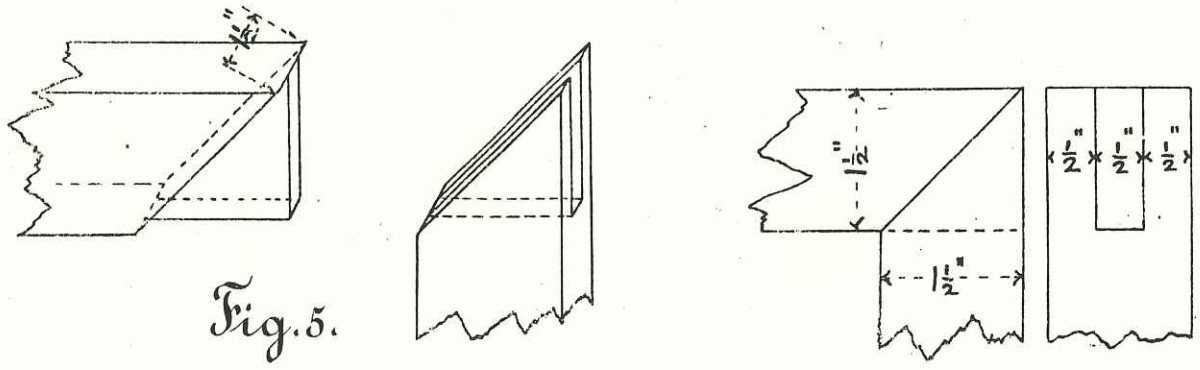


HANHART LITH.

Drawing No. 4 Joints

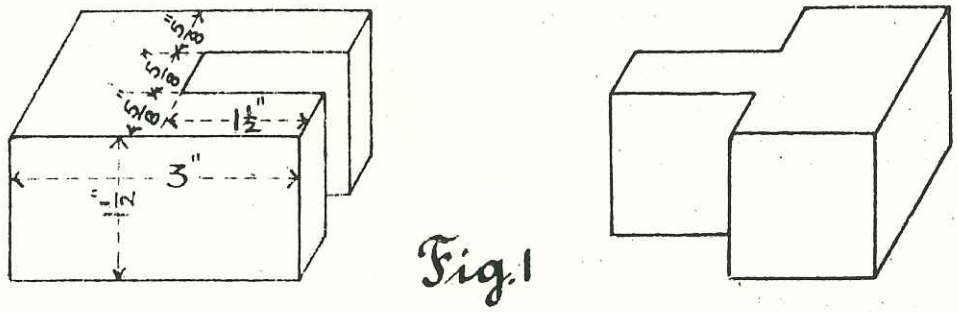


Fig. 1

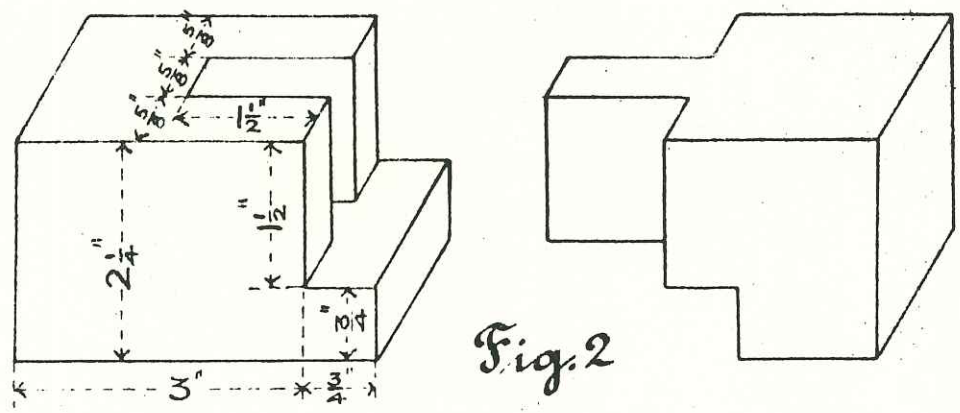


Fig. 2

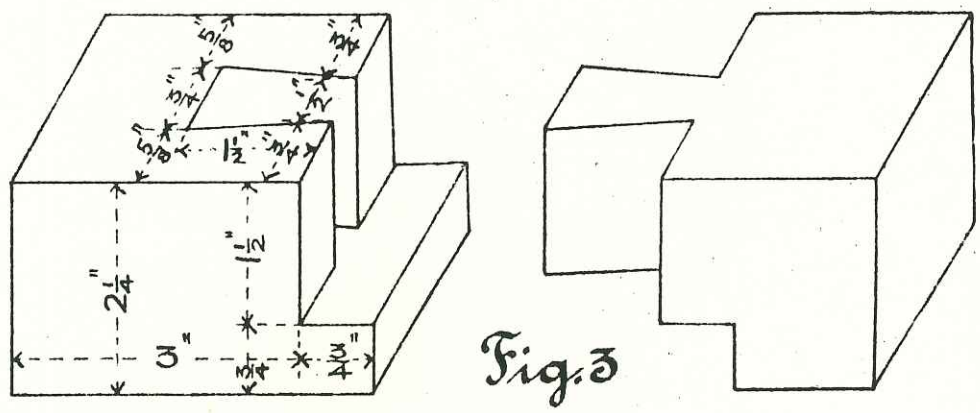


Fig. 3

Scarph.

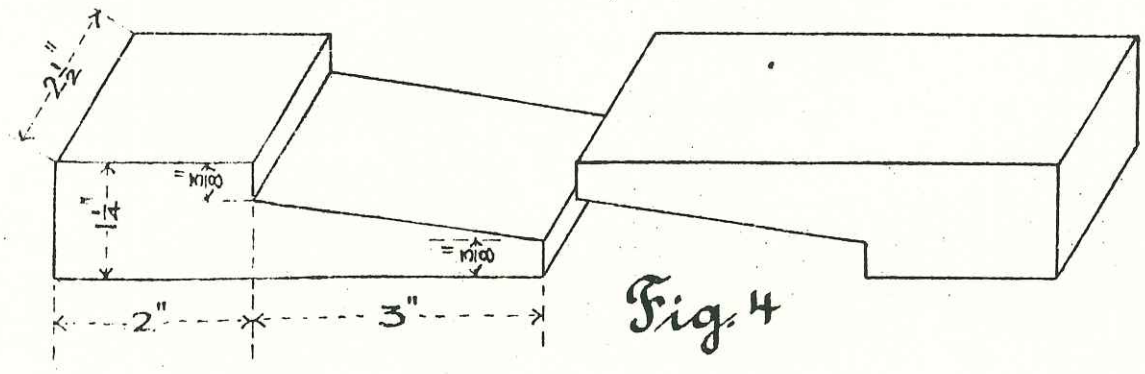


Fig. 4

Drawing No. 5.

Simple Joints.

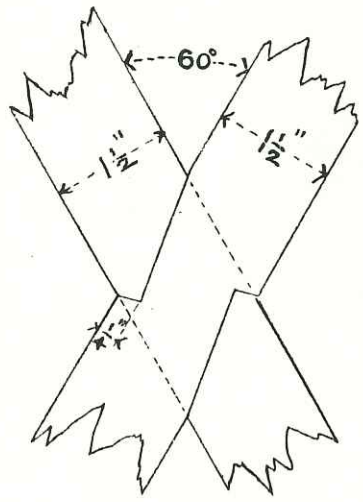
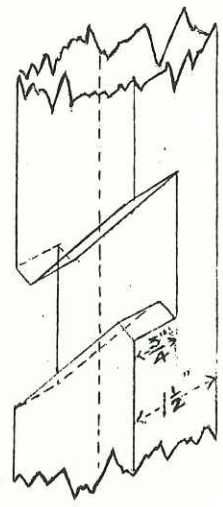
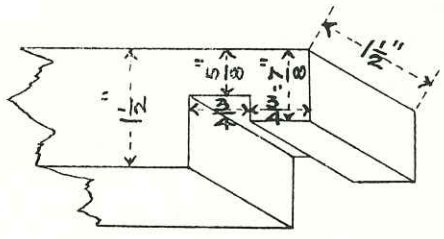


Fig. 1.



Halving.



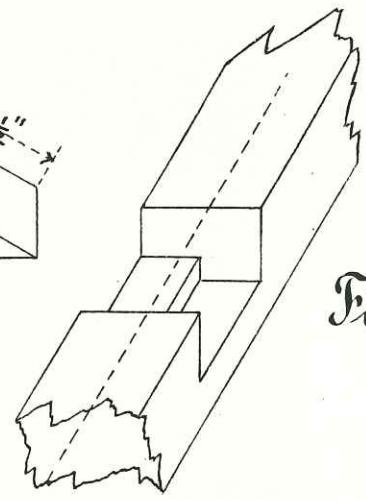
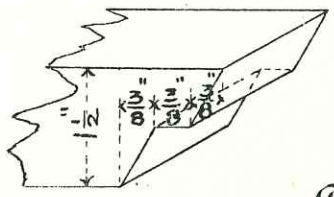


Fig. 2.



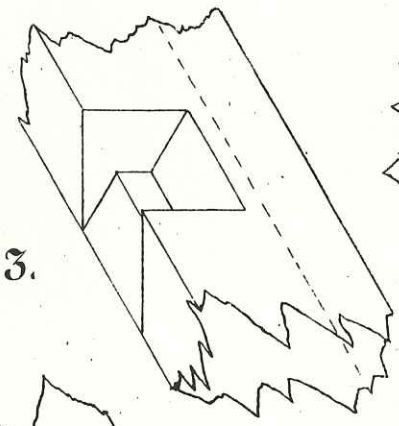
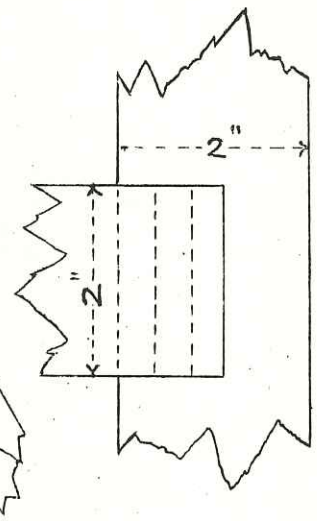
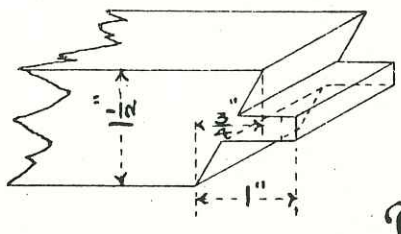


Fig. 3.





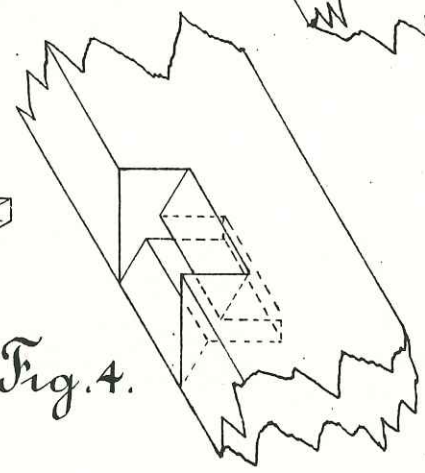
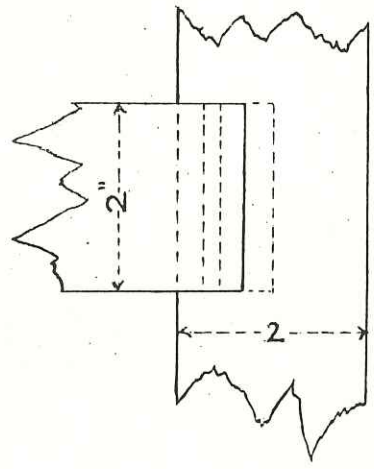


Fig. 4.



HANHART LITH.

Drawing No. 6

Joints

Oblique Mortice & Tenon

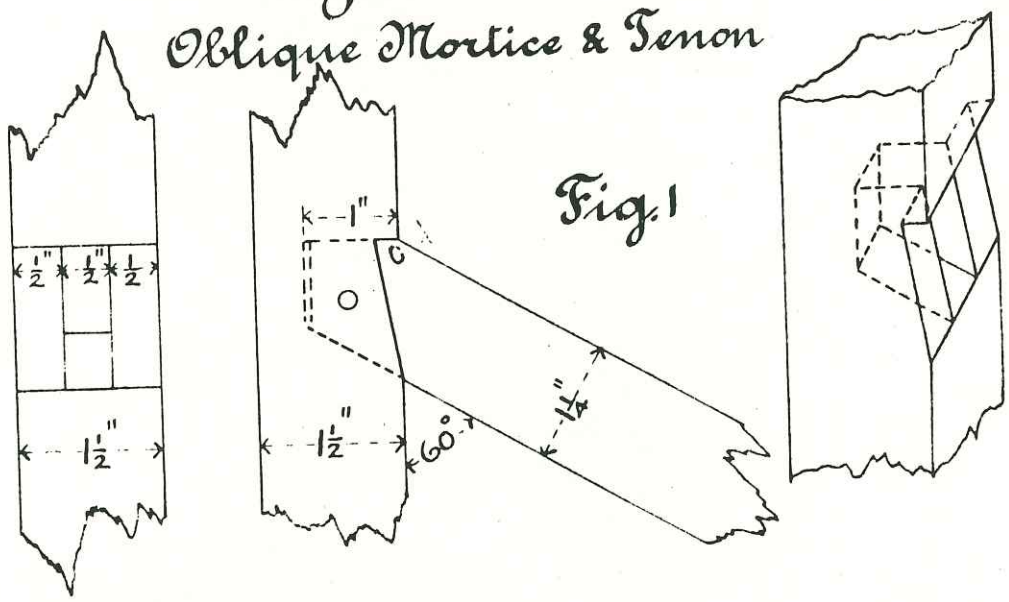


Fig. 1

Halving.

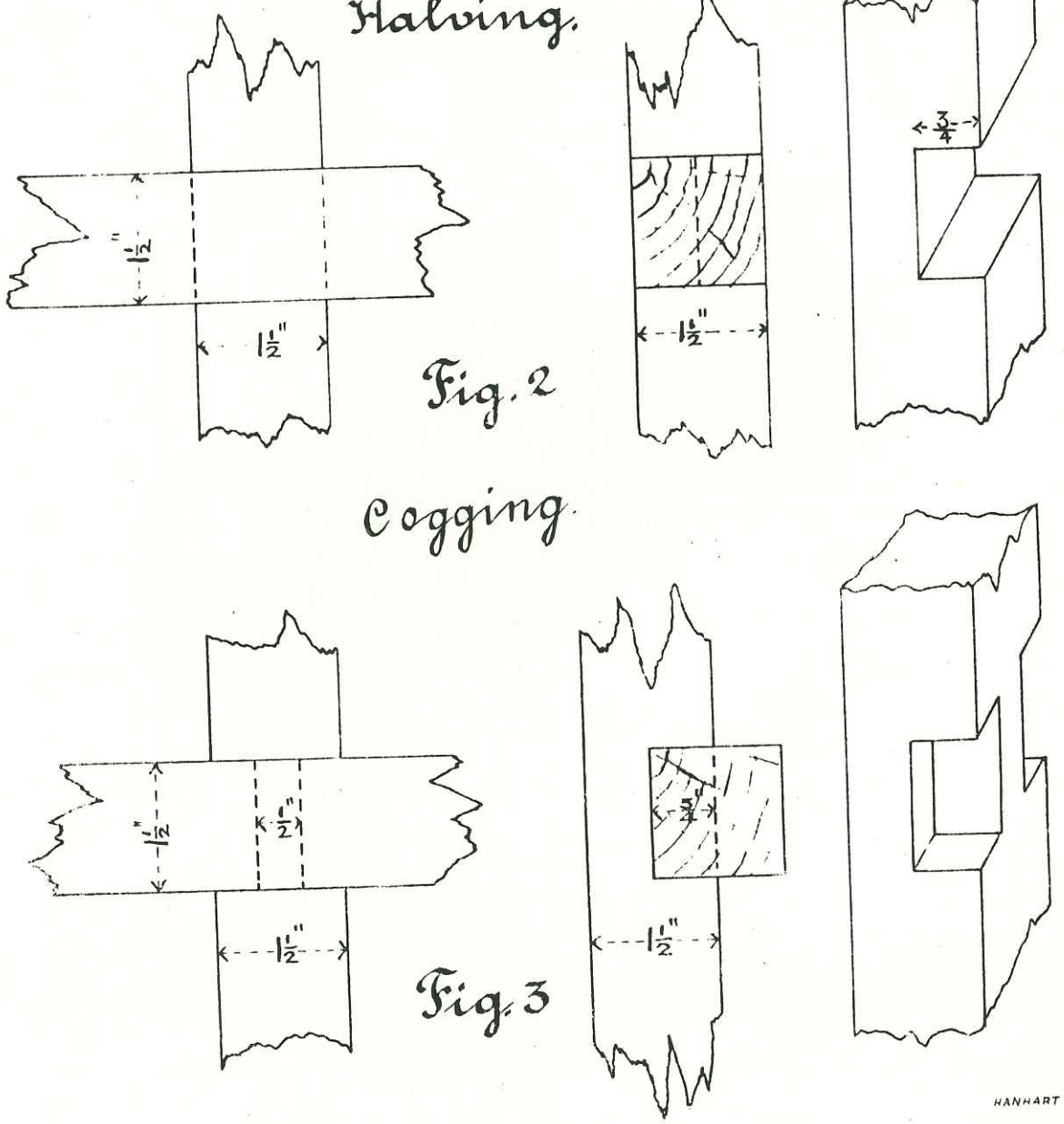


Fig. 2

Cogging

Fig. 3

HANHART LITH

Drawing No 7 Joints (at right angles)

Mortice & Tenon.

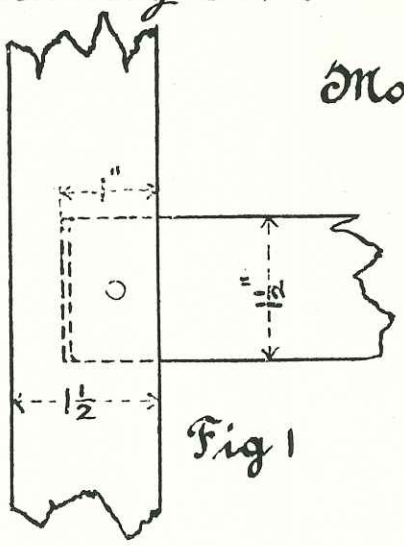


Fig 1

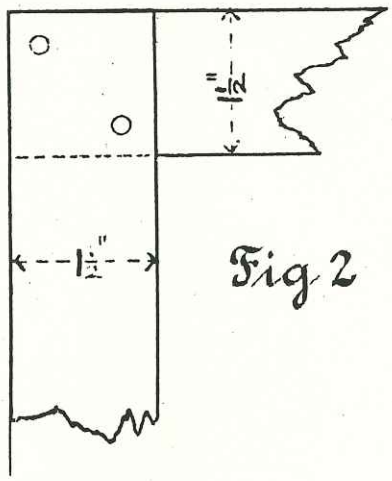
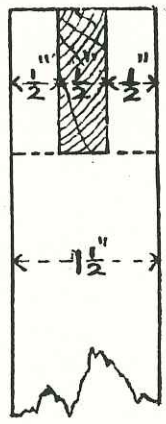
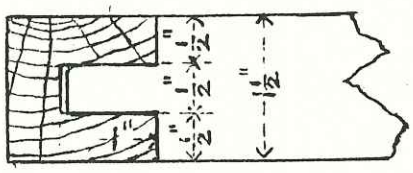


Fig 2





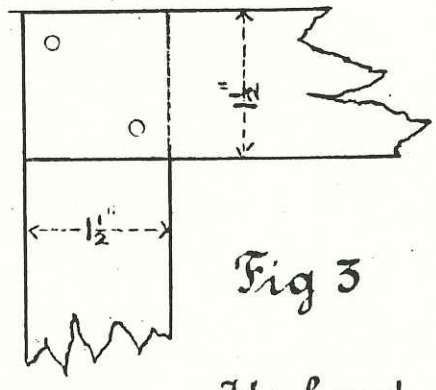


Fig 3

Halved.

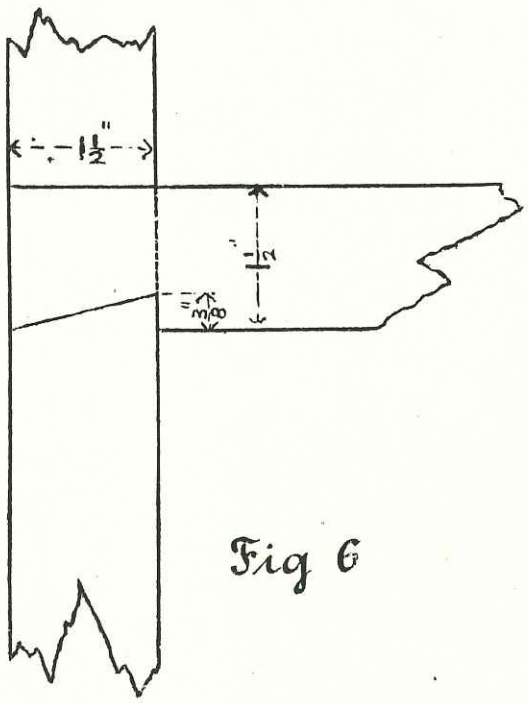


Fig 6

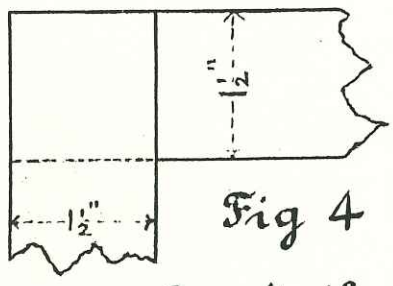
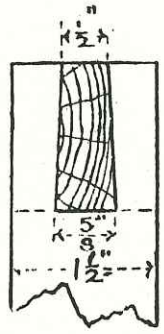
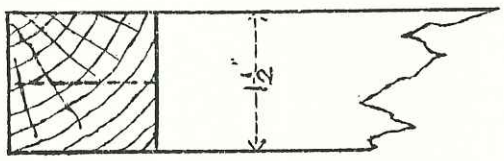


Fig 4



Dovetailed.



Dovetail Notching.

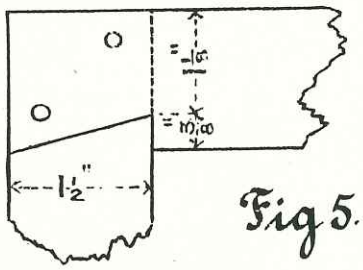
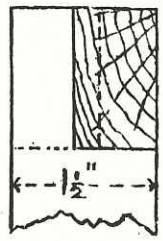
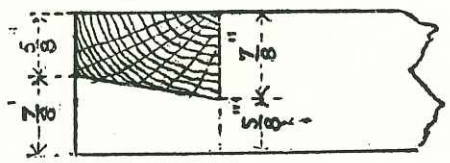


Fig 5.





Dovetail Halved.

Dovetails.

Drawing No. 8.

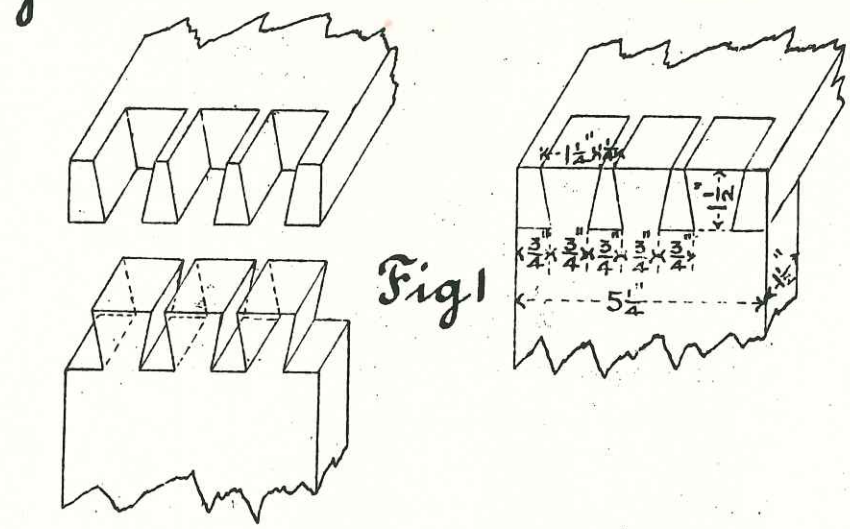


Fig 1

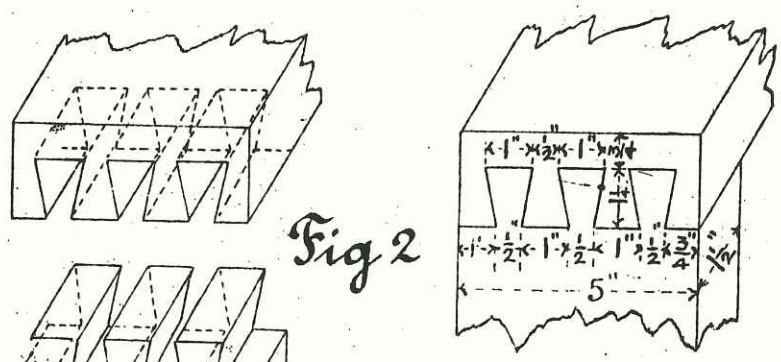


Fig 2

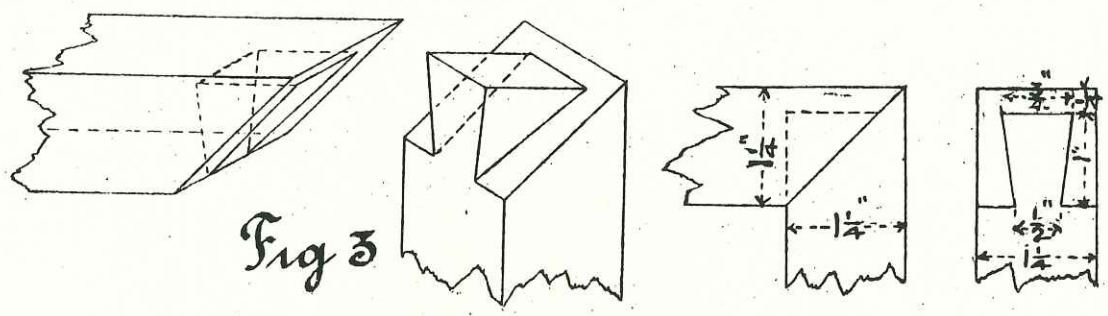


Fig 3

Secret Dovetails

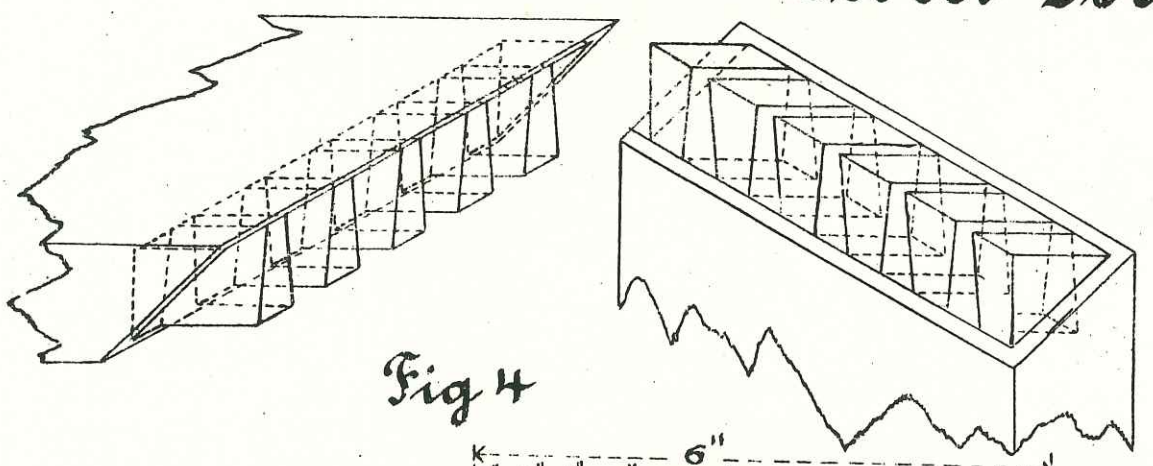
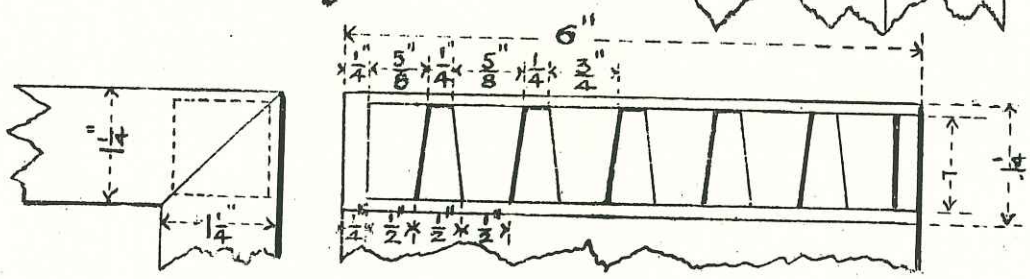
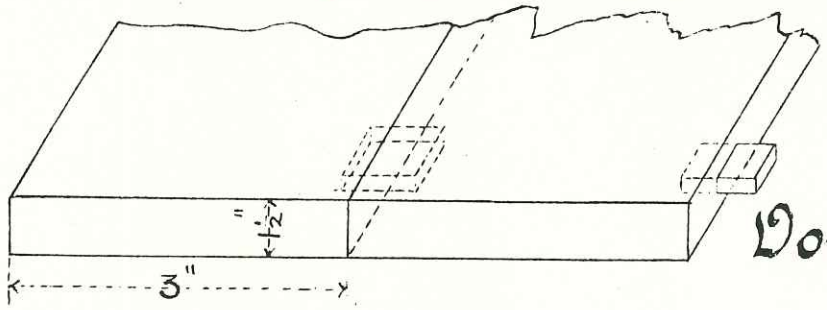


Fig 4

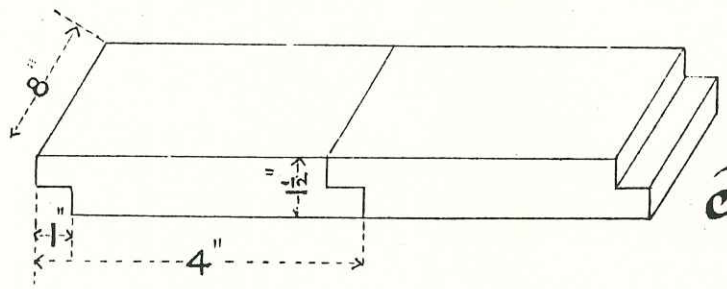


Drawing № 9

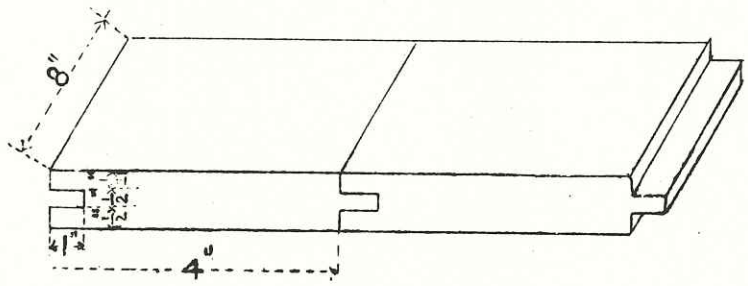
Joining Boards.



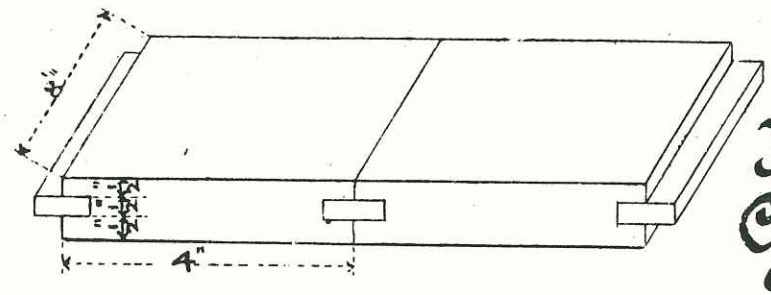
Dowels.



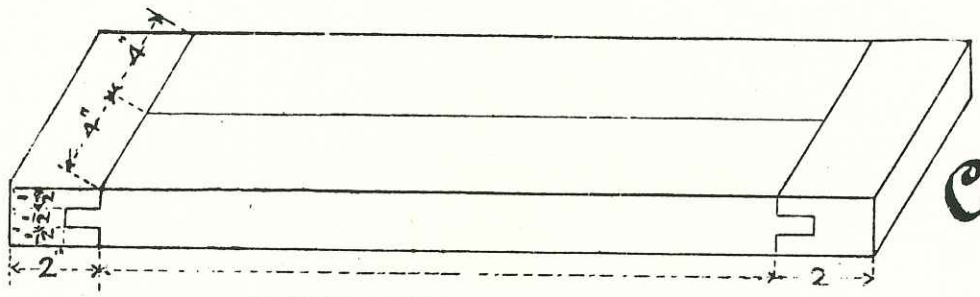
Rebate.



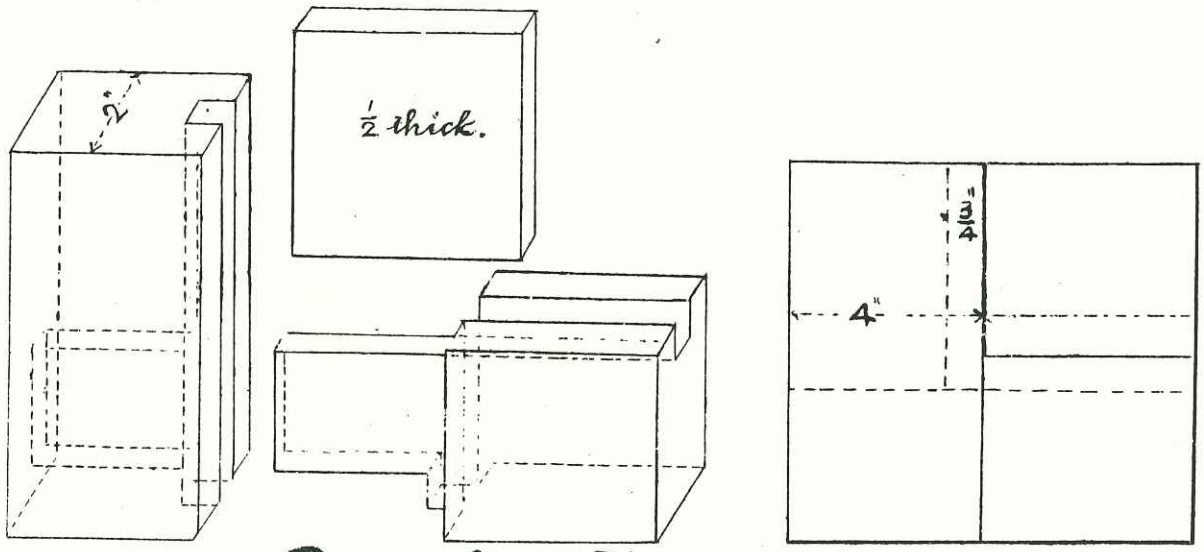
Tongue & Groove.



Key & Groove



Clamps.

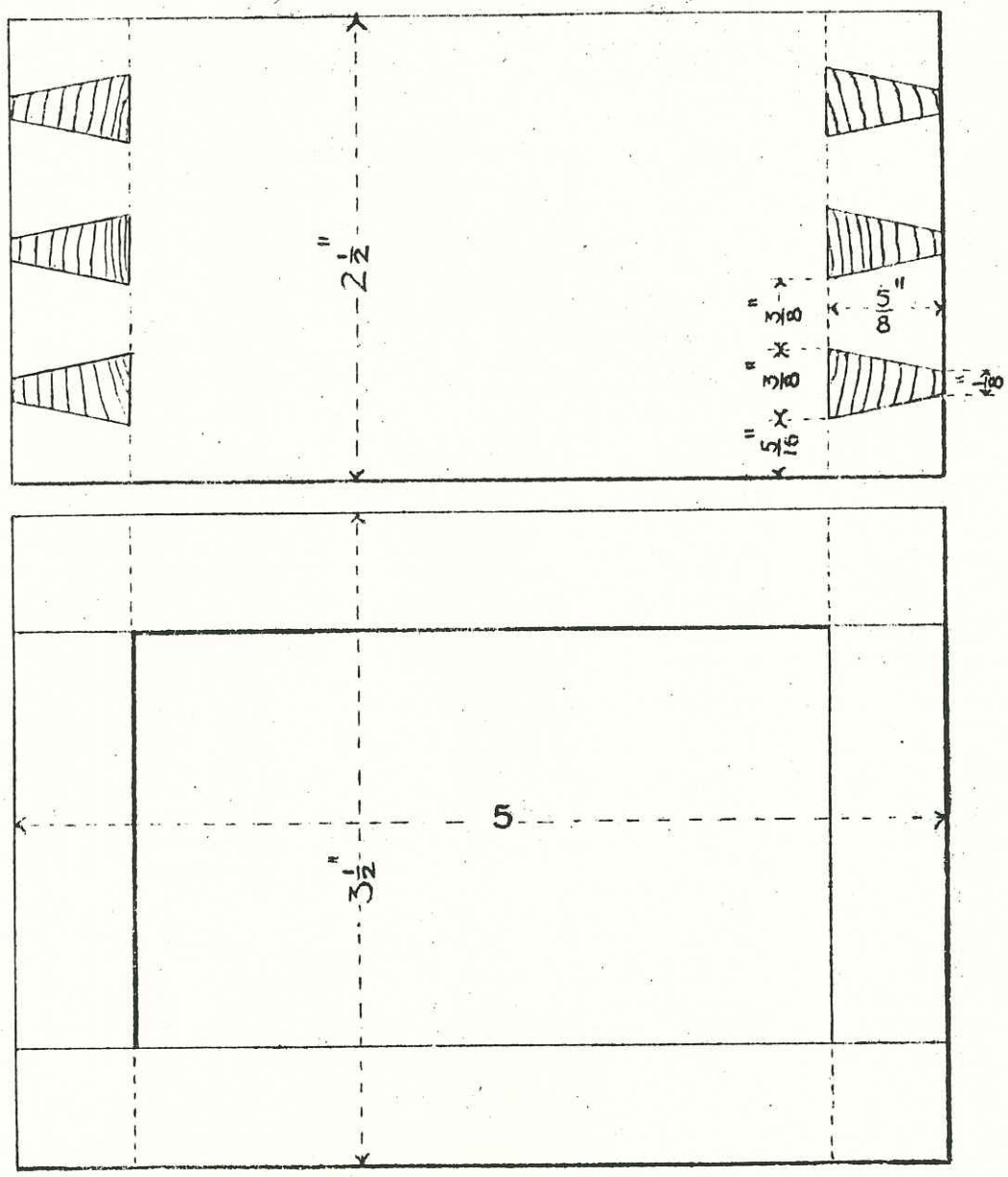


Panel & Frame.

HANHART LITH.

Drawing No. 10

Joinery.

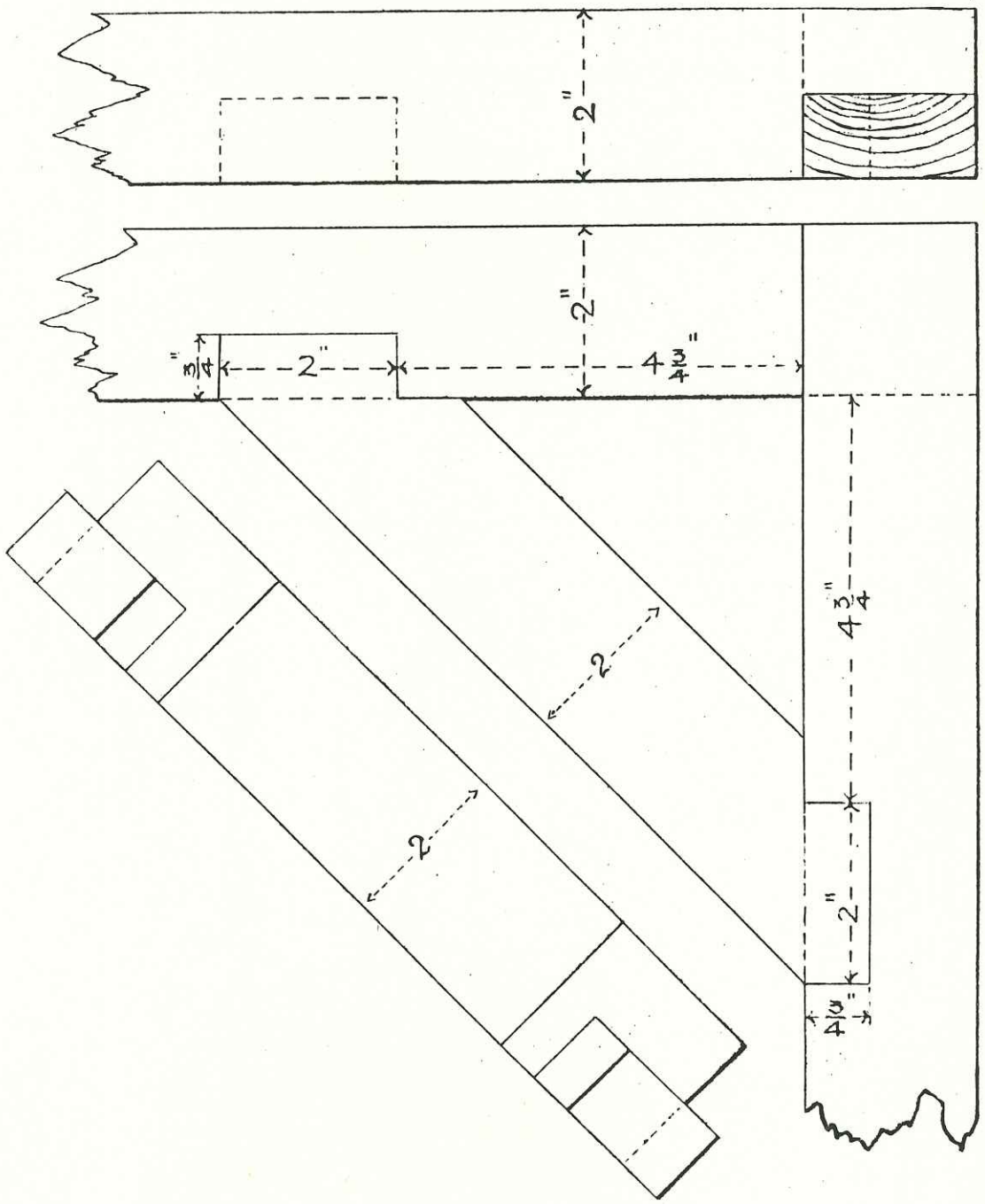


Dovetails.

Scale Full Size

Drawing No. 11

Carpentry.

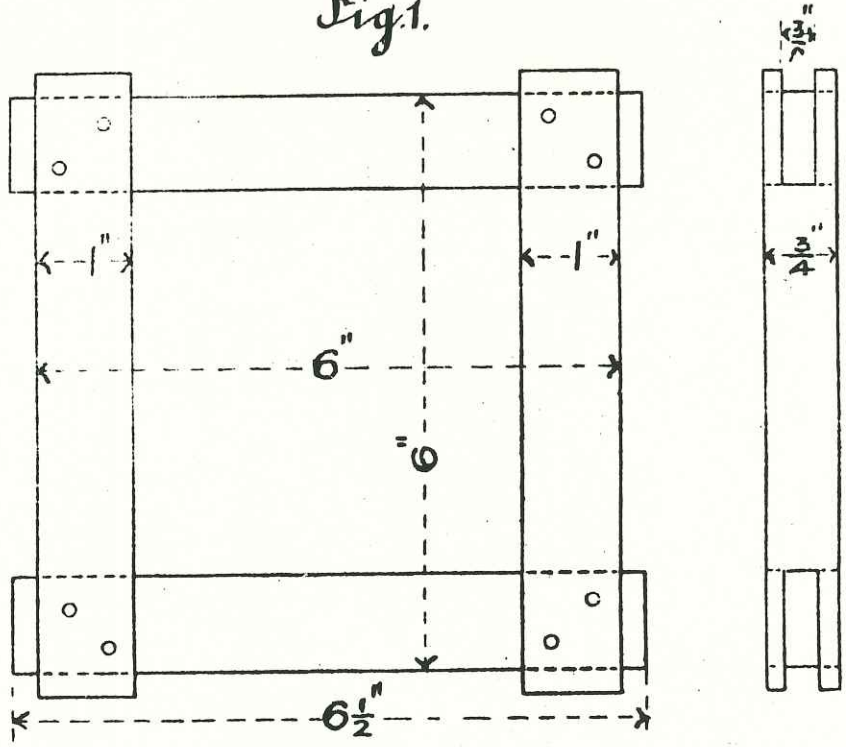


Scale Half Full Size.

Drawing No 12.

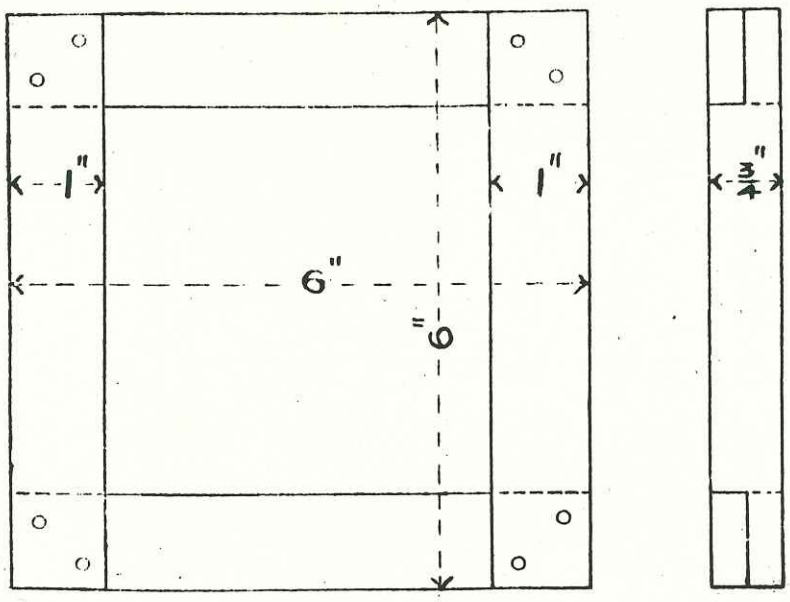
Joinery.

Fig. 1.



Make a frame of dimensions given above.

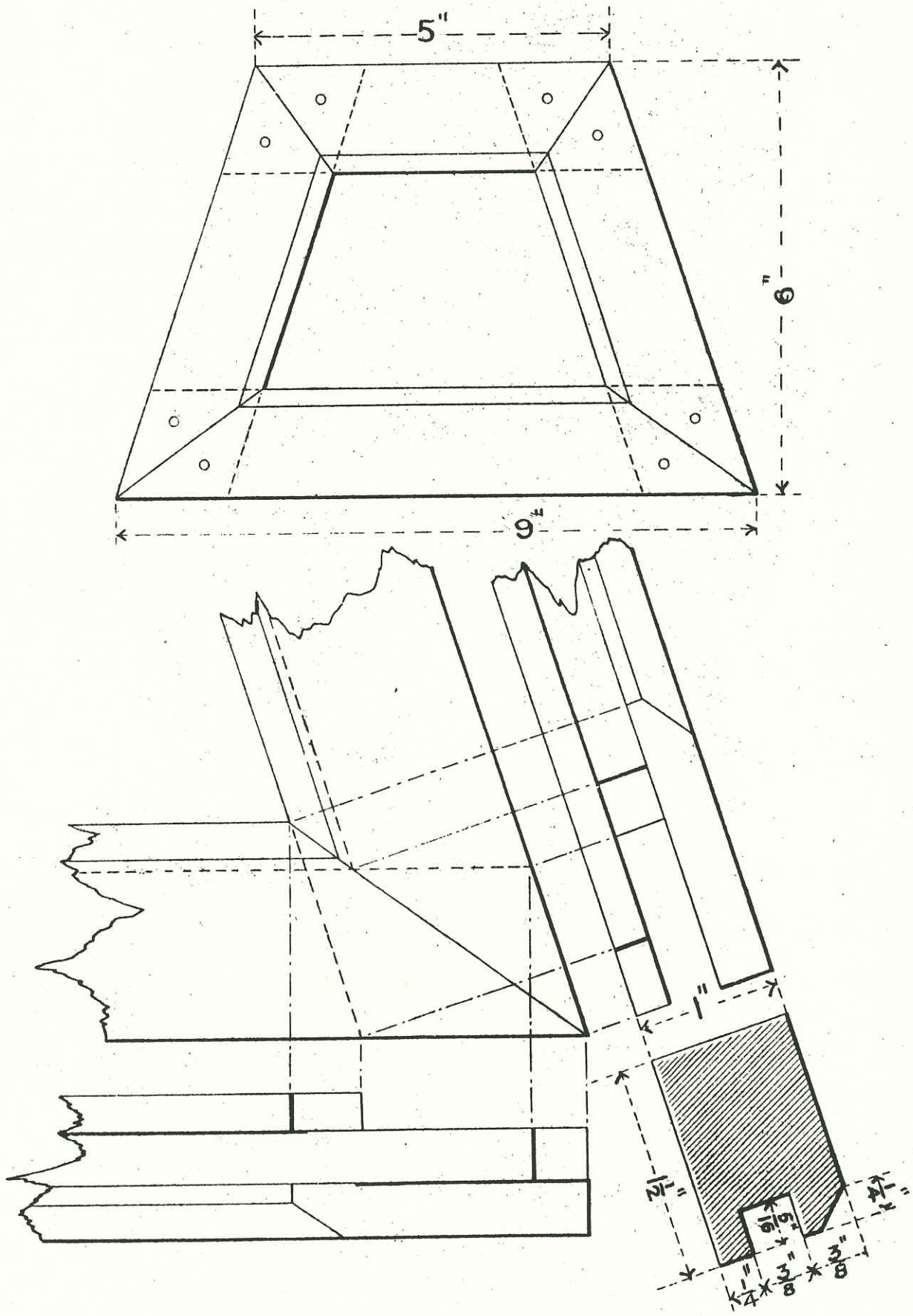
Fig. 2.



Similar Frame, Joints Halved

Drawing No. 13

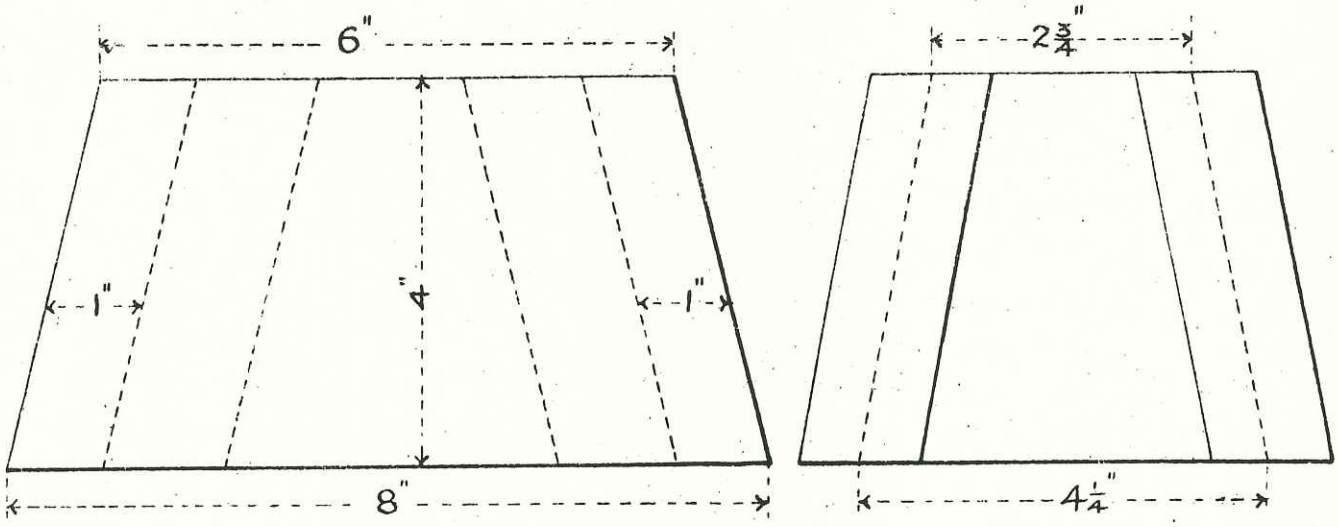
Joinery.

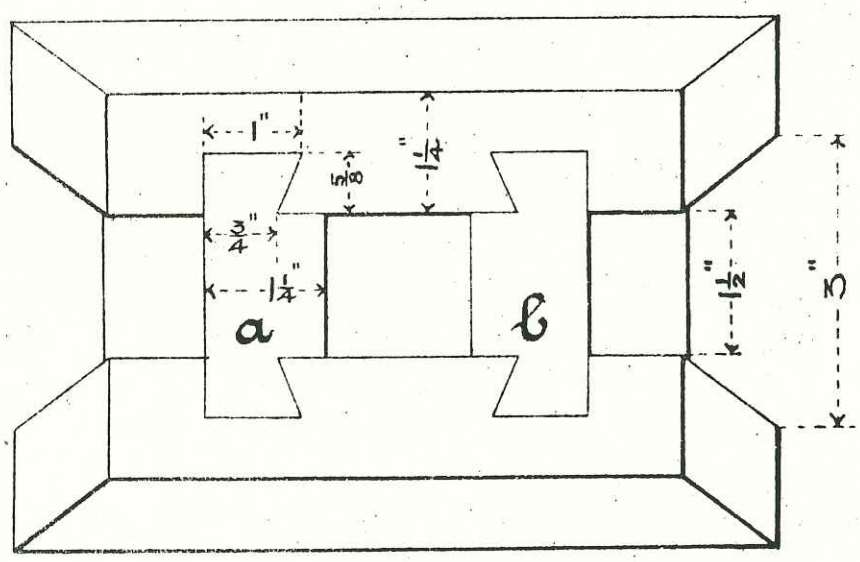


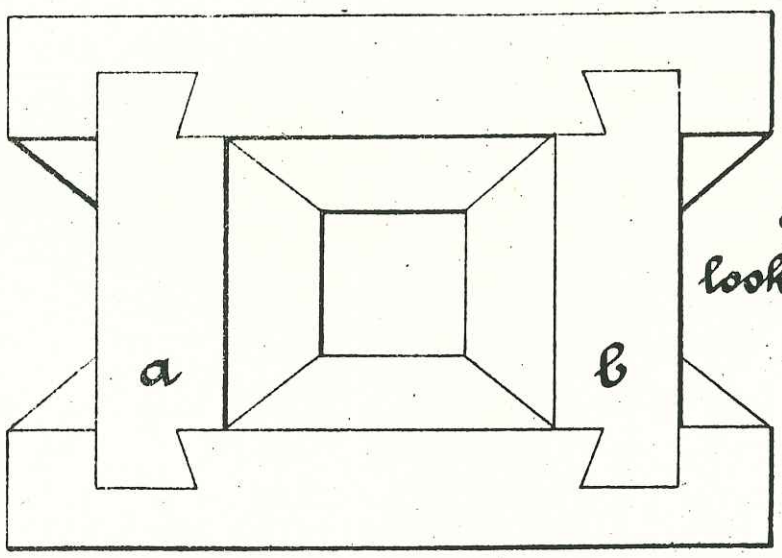
Make a frame of Dimensions given above.

Drawing No. 14

Joinery.





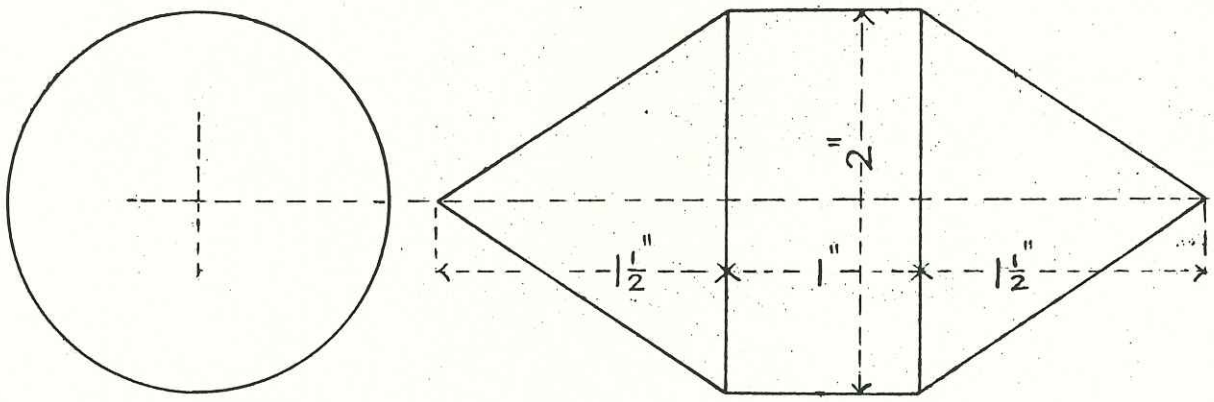


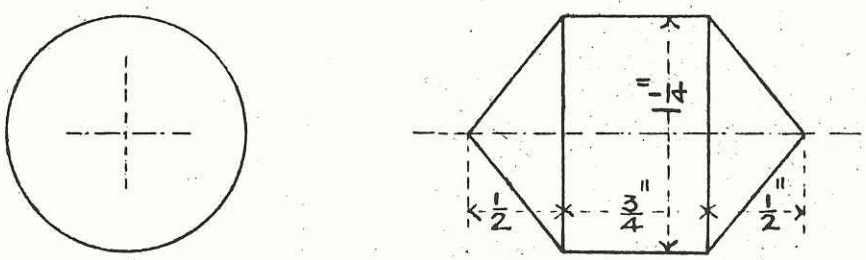
Plan looking on bottom.

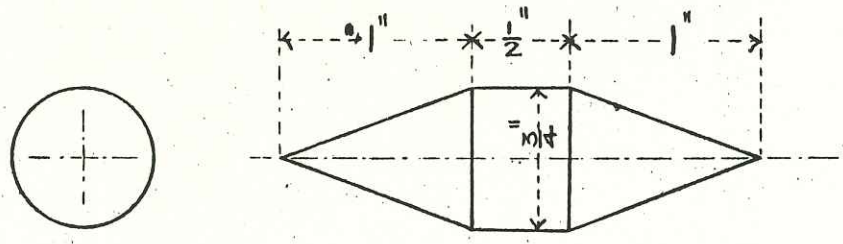
In putting together, the two pieces a b must be driven home at the same time

Drawing No. 15.

Wood Turning.



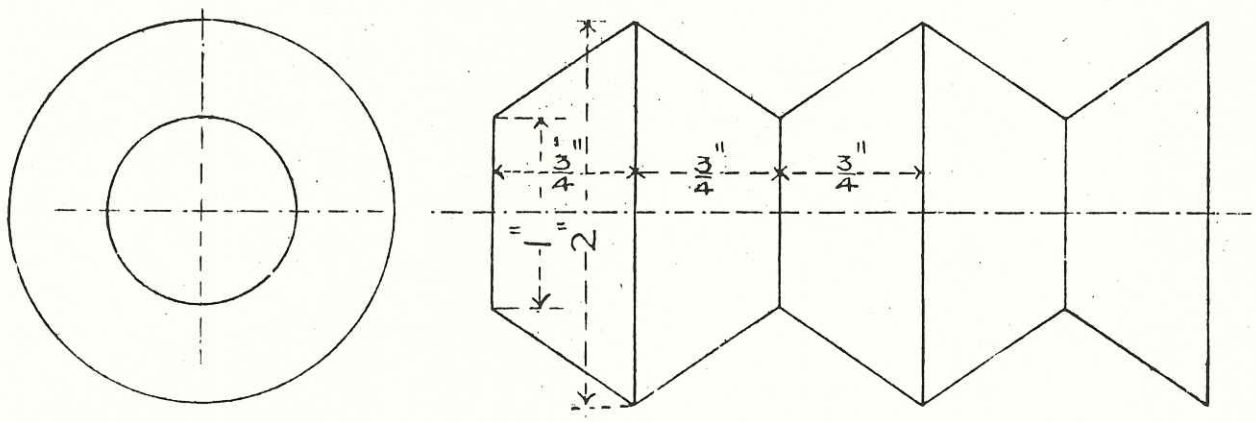


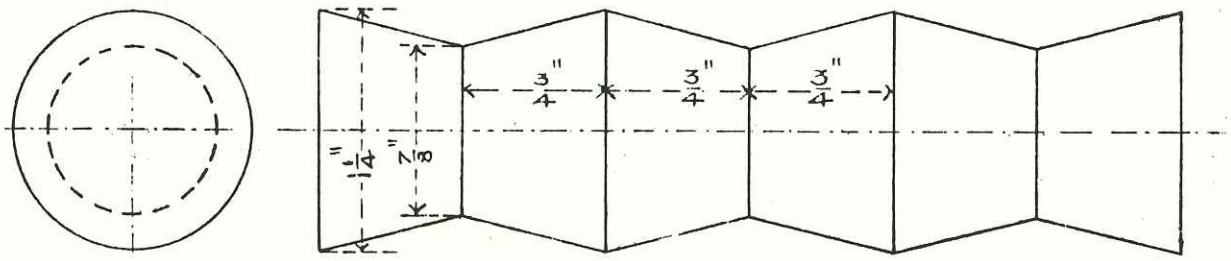


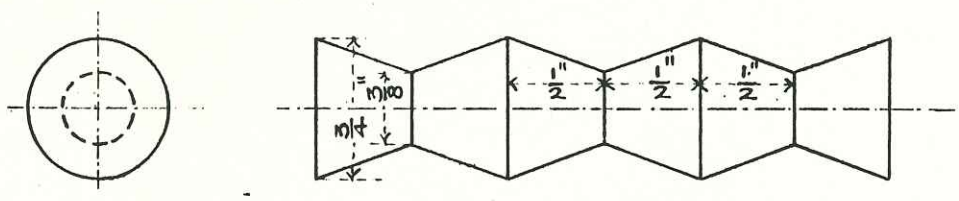
Full Size.

Drawing No. 16

Wood Turning.



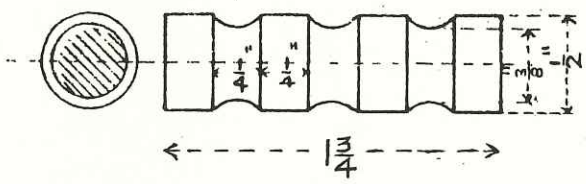


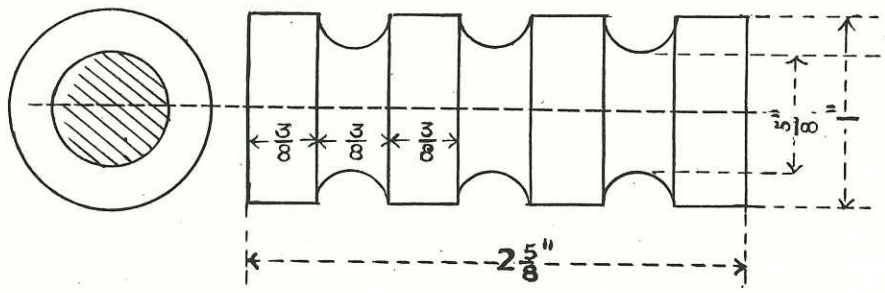


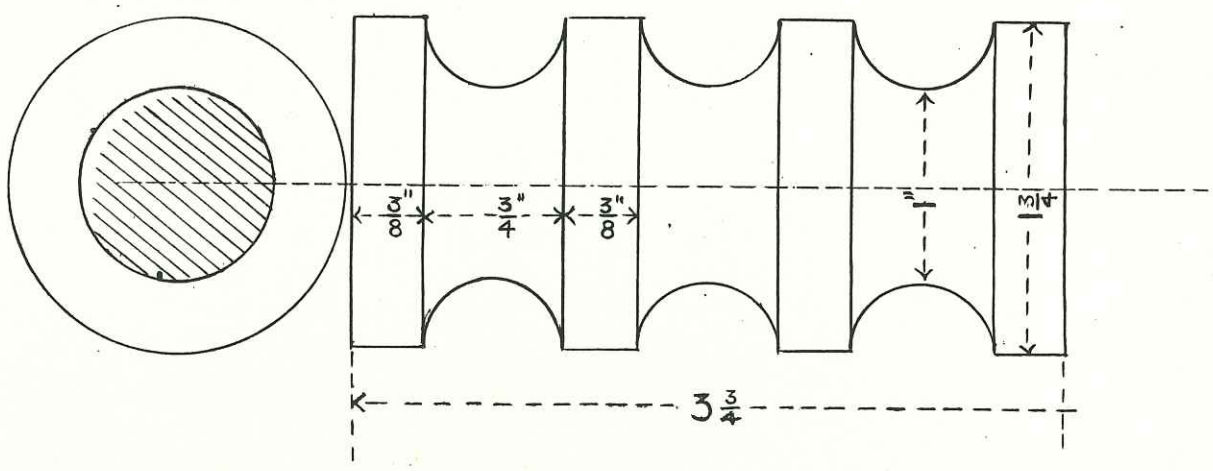
Full Size

Drawing No. 17

Wood Turning.



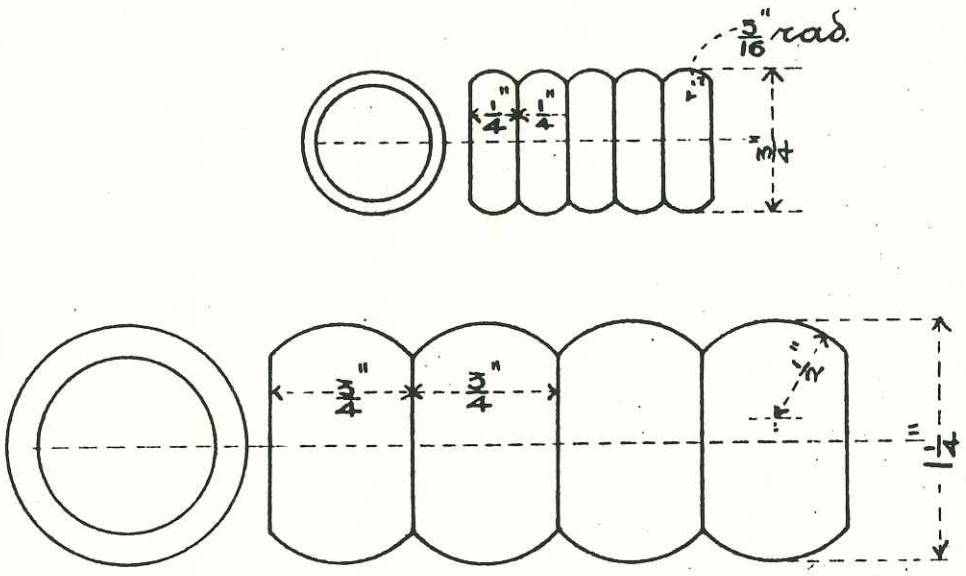




Full Size.

Drawing No. 18.

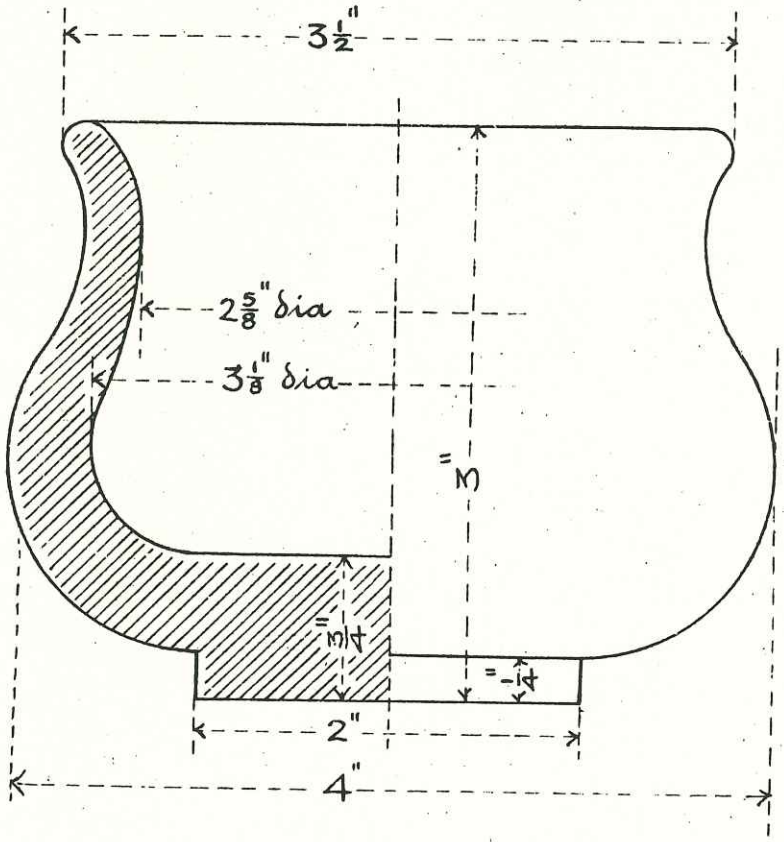
Wood Turning

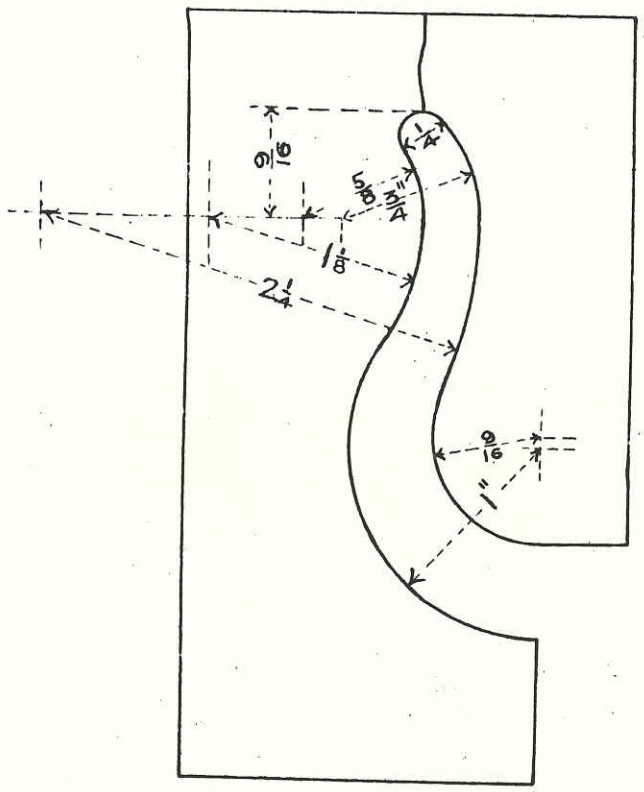


Full Size

Drawing No. 19.

Wood Turning.





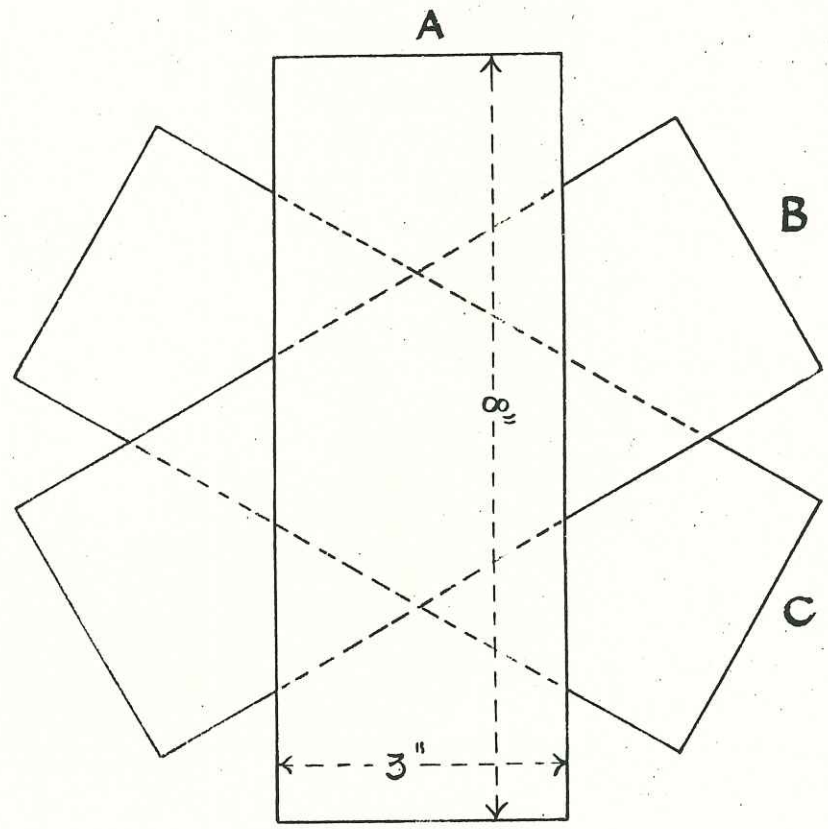
Templates for Turning.

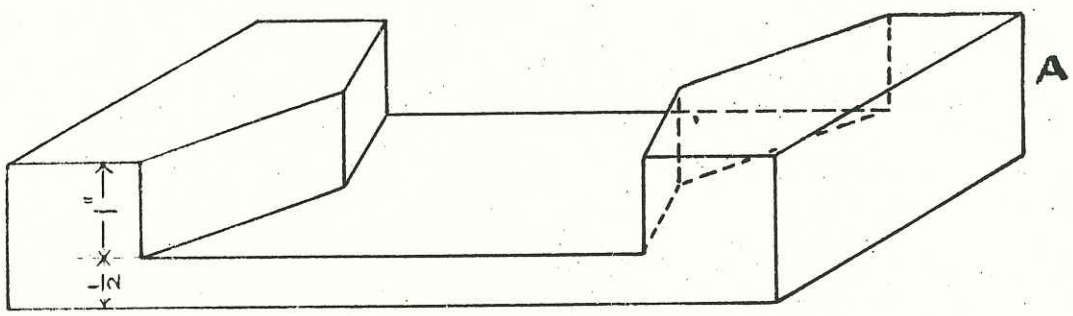
Scale Half Full Size.

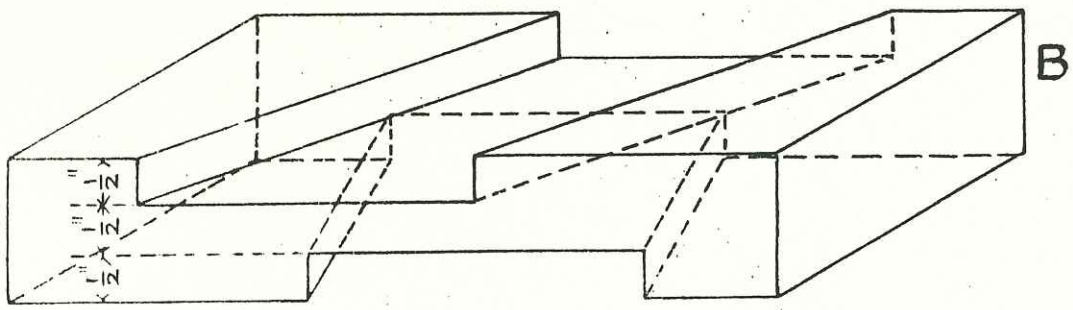
Drawing No. 20.

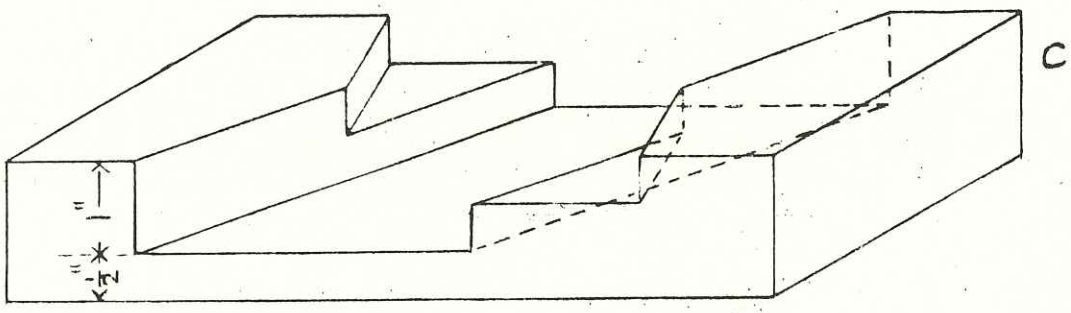
Patternmaking

Wheel Arms





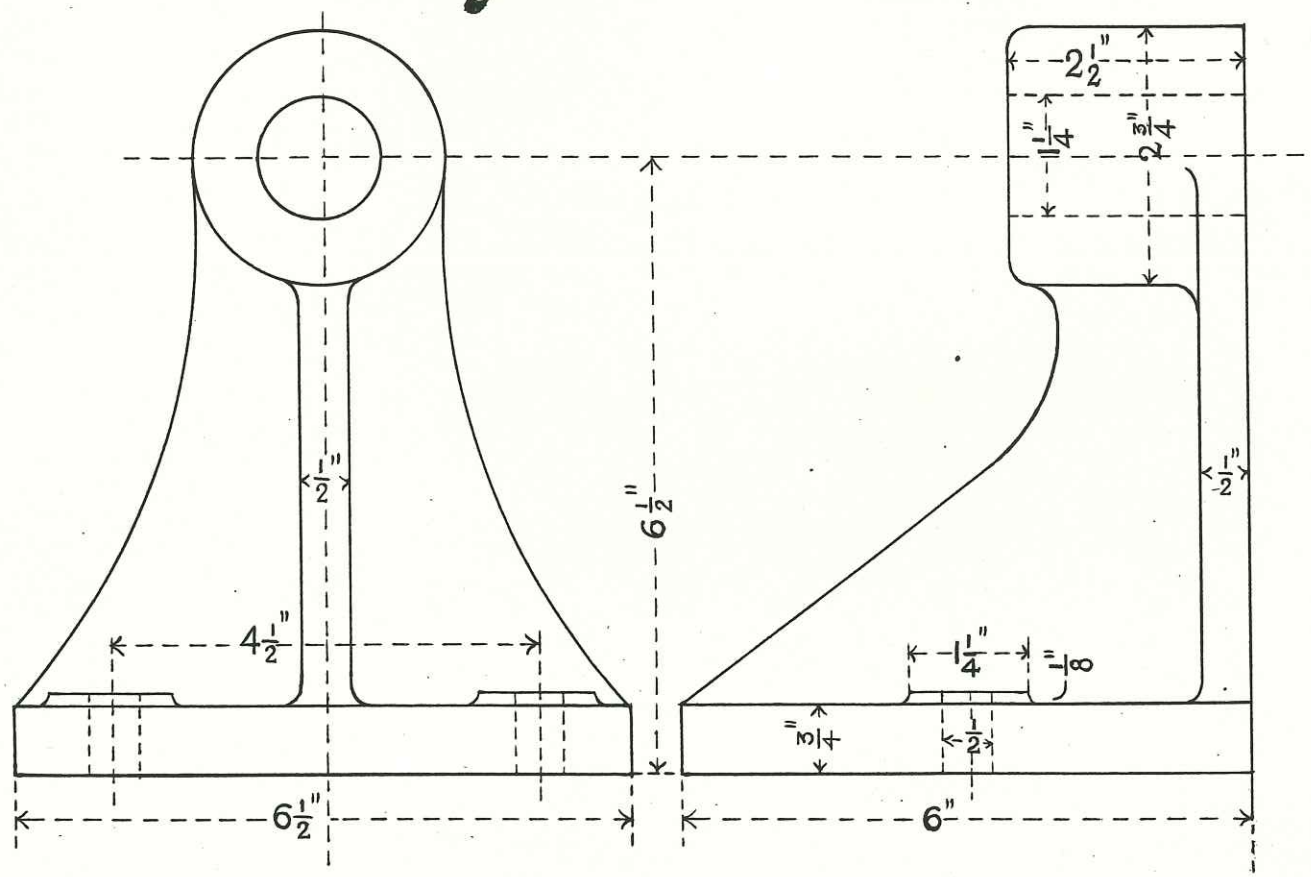




HANHART LITH.

Drawing No. 21.

Pattern of Small Bracket



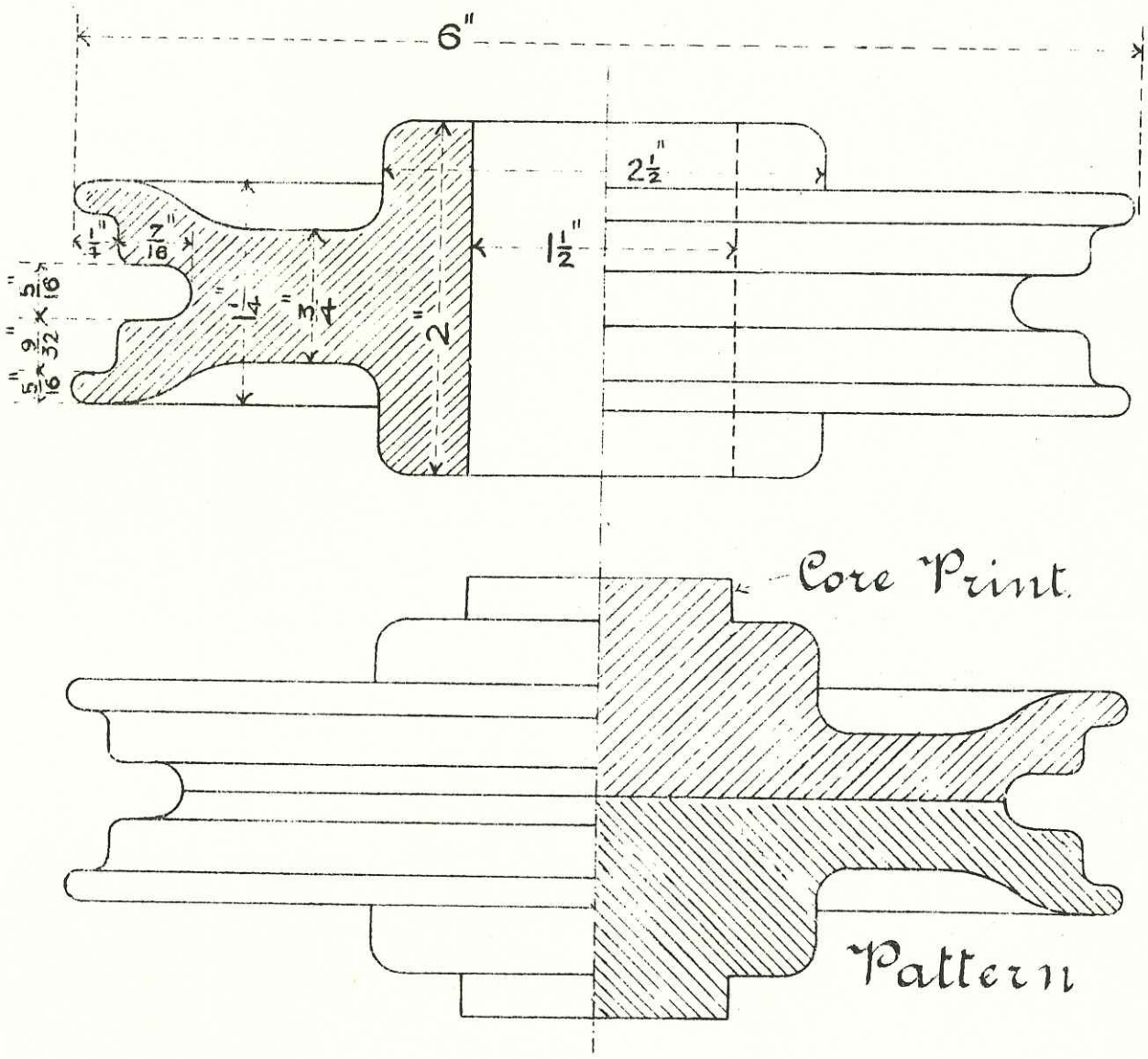
Scale Half Full Size

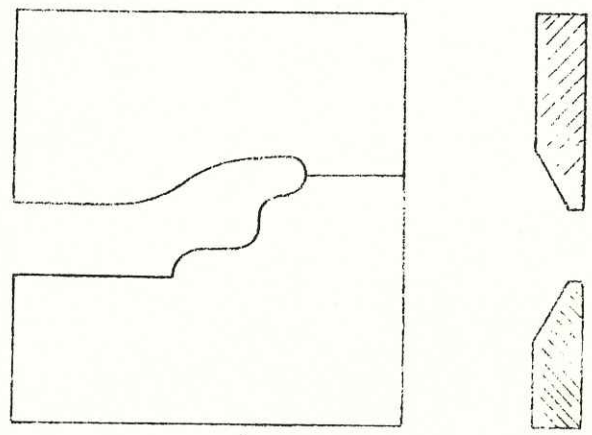
Put on Core prints and make Core boxes.
Allow ⅛" in 1 foot contraction in casting.

Drawing No. 22

Patternmaking.

Chain Pulley.





Templates for Turning.

Drawing № 23.

Patternmaking.

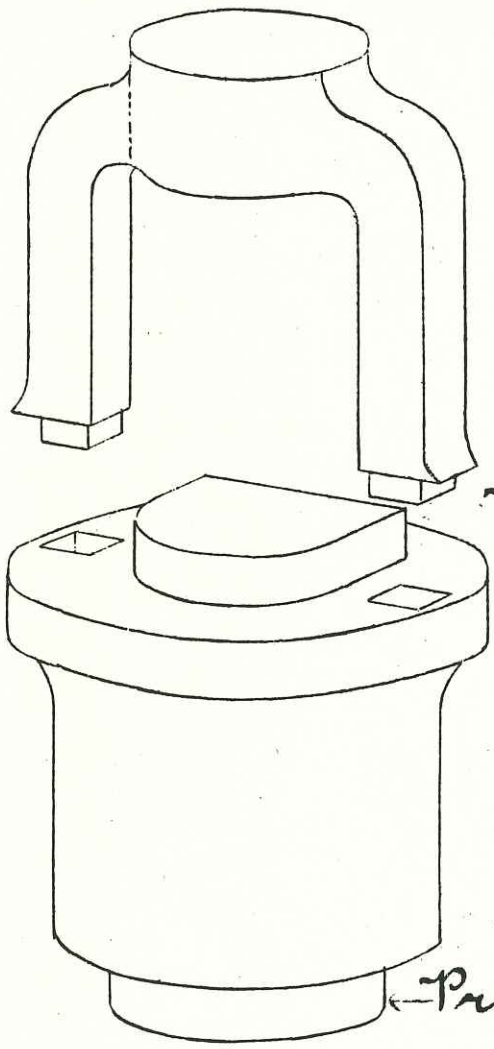
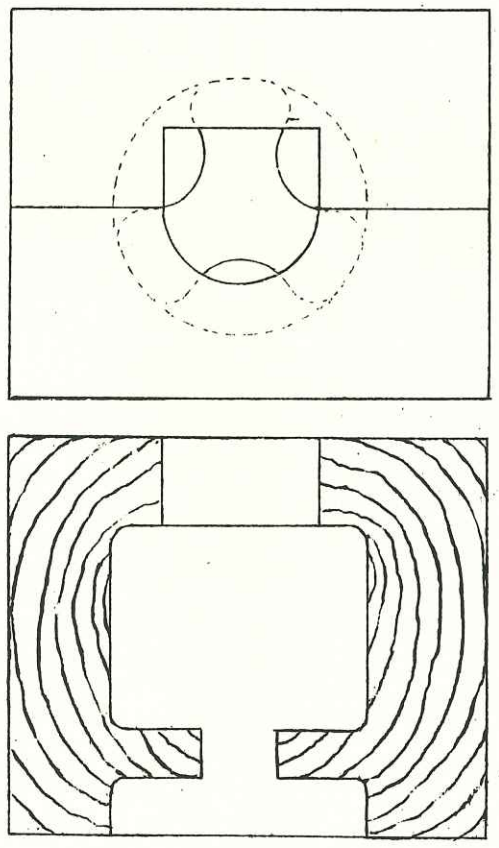


Fig 2

Bucket turned out of solid & stirrup tenoned into it
Place prints for core.
Allow $\frac{3}{16}$" per foot for contraction, & $\frac{1}{8}$" on outside diameter for turning

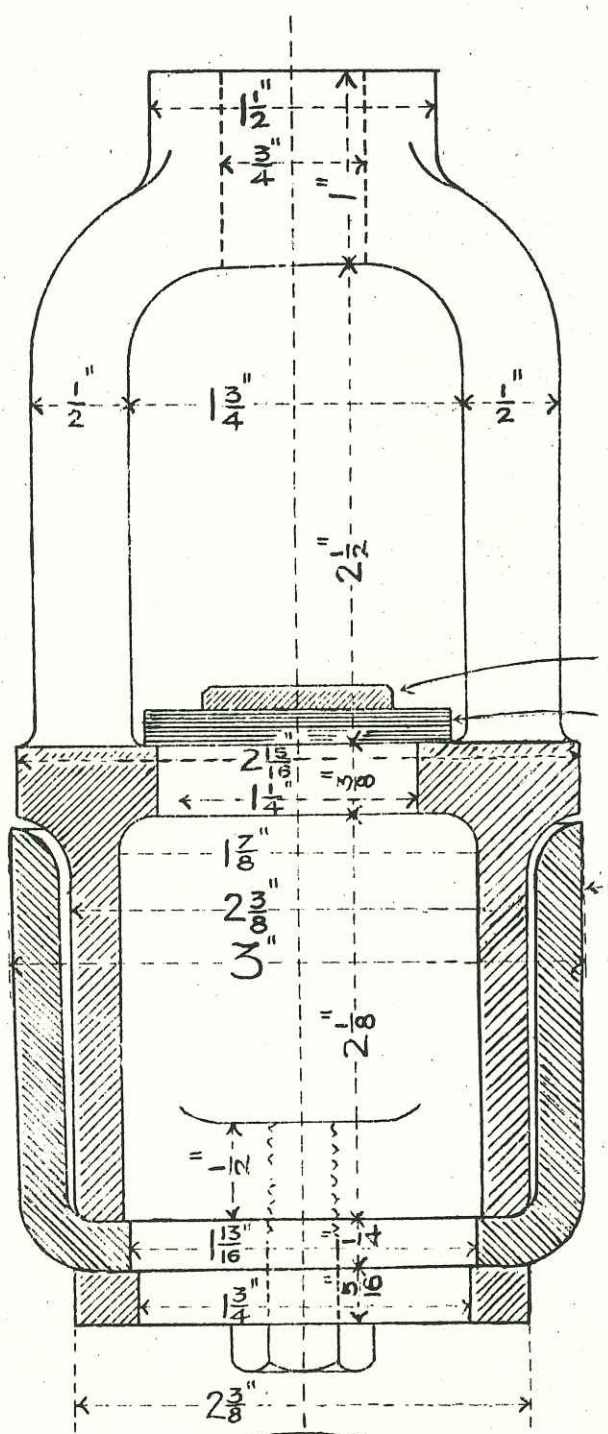


Core Box
in halves.

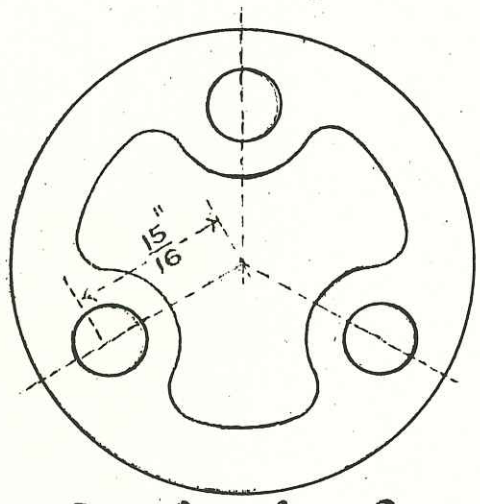
Fig 3

Drawing No. 24

Patternmaking.



Cup Leather.



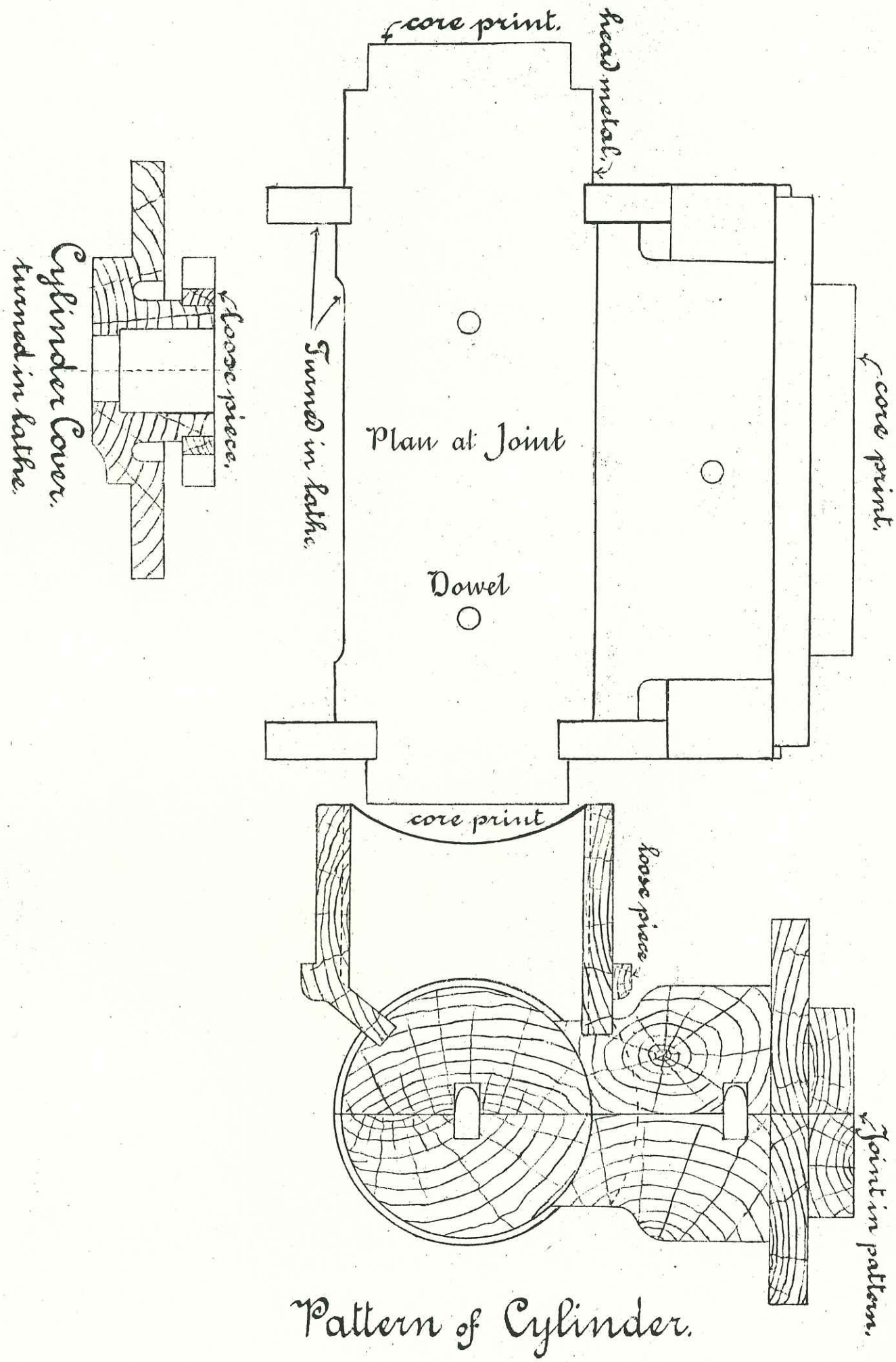
Cup Leather Guard

Fig 1

Full Size.

Drawing No 25

Patternmaking.



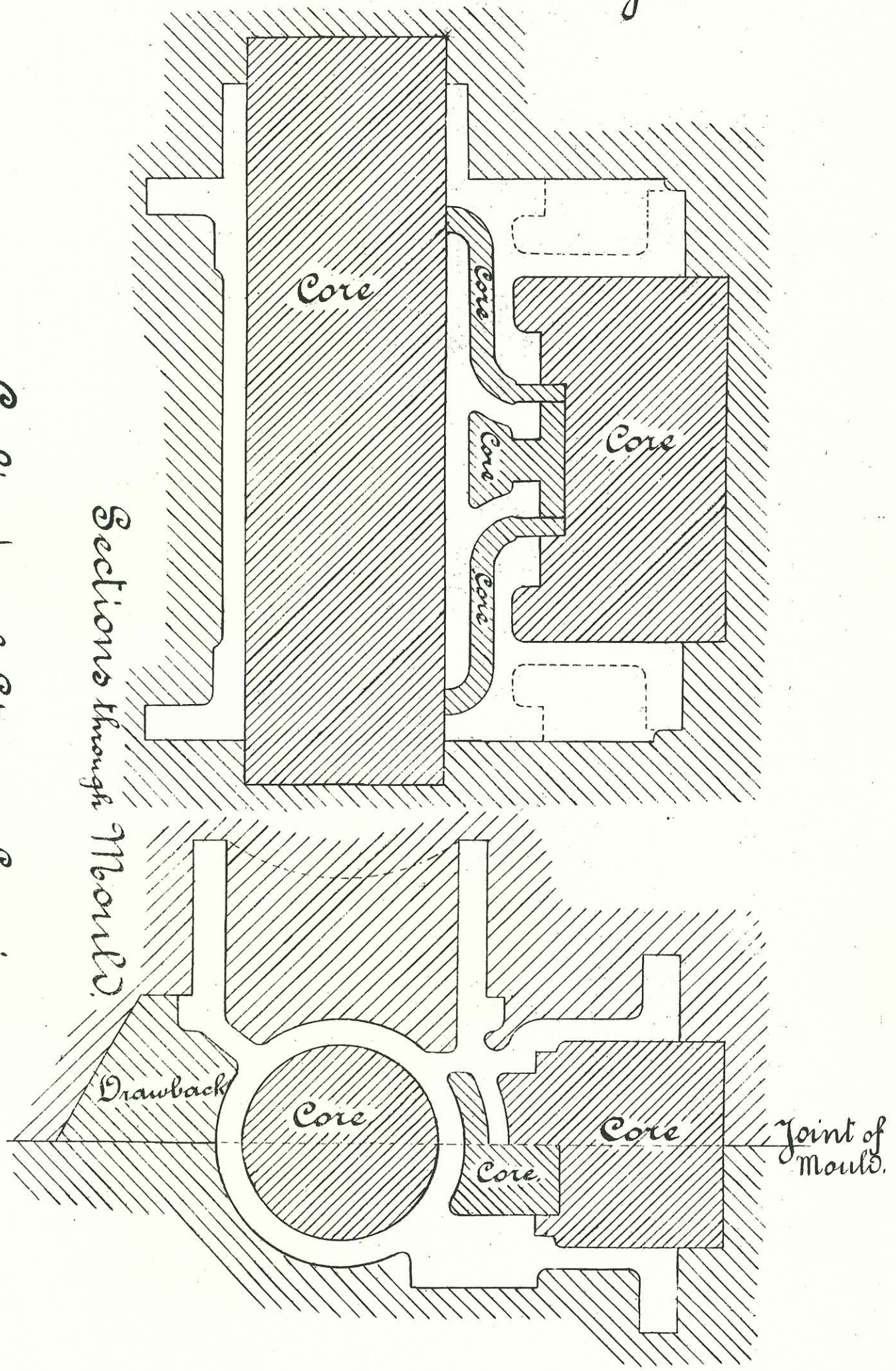
Pattern of Cylinder.

Drawing No. 26

Patternmaking.

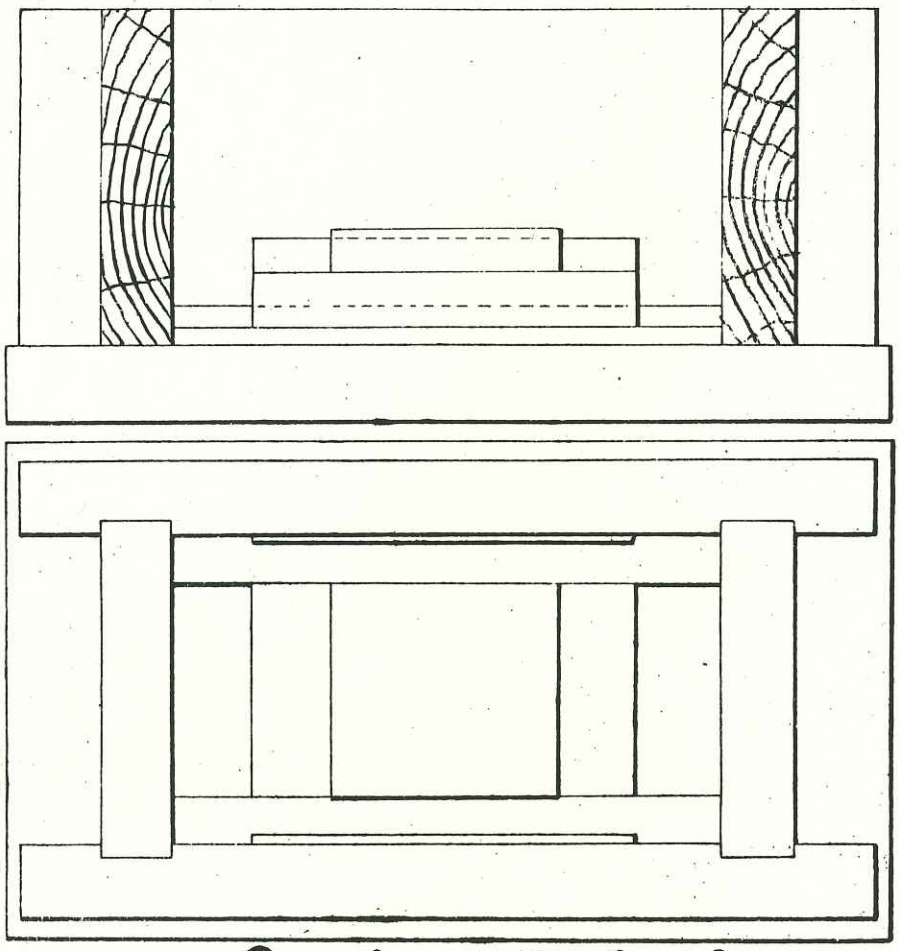
Cylinder of Steam Engine.

Section through Mould.

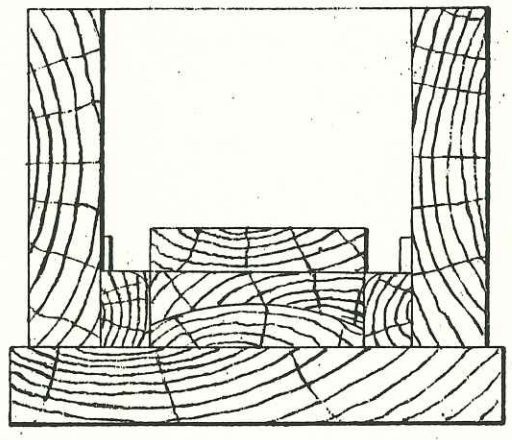


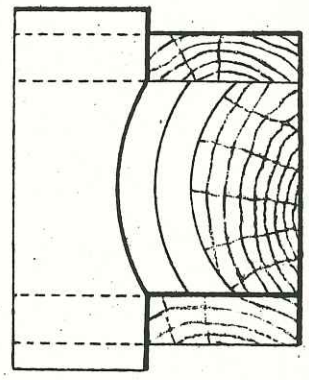
Drawing No. 27

Patternmaking.

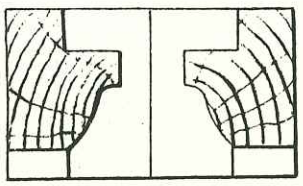


Core-box for Valve Casing.

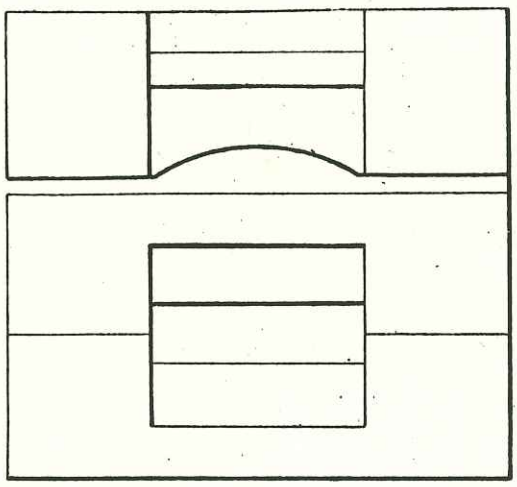


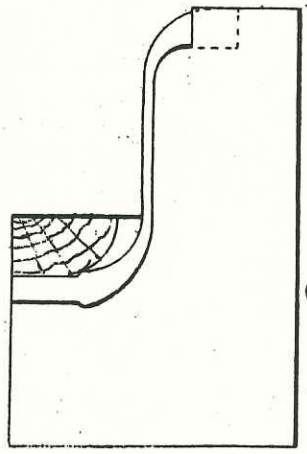


Core-box for Steam Ports.



Core-box for Exhaust Port

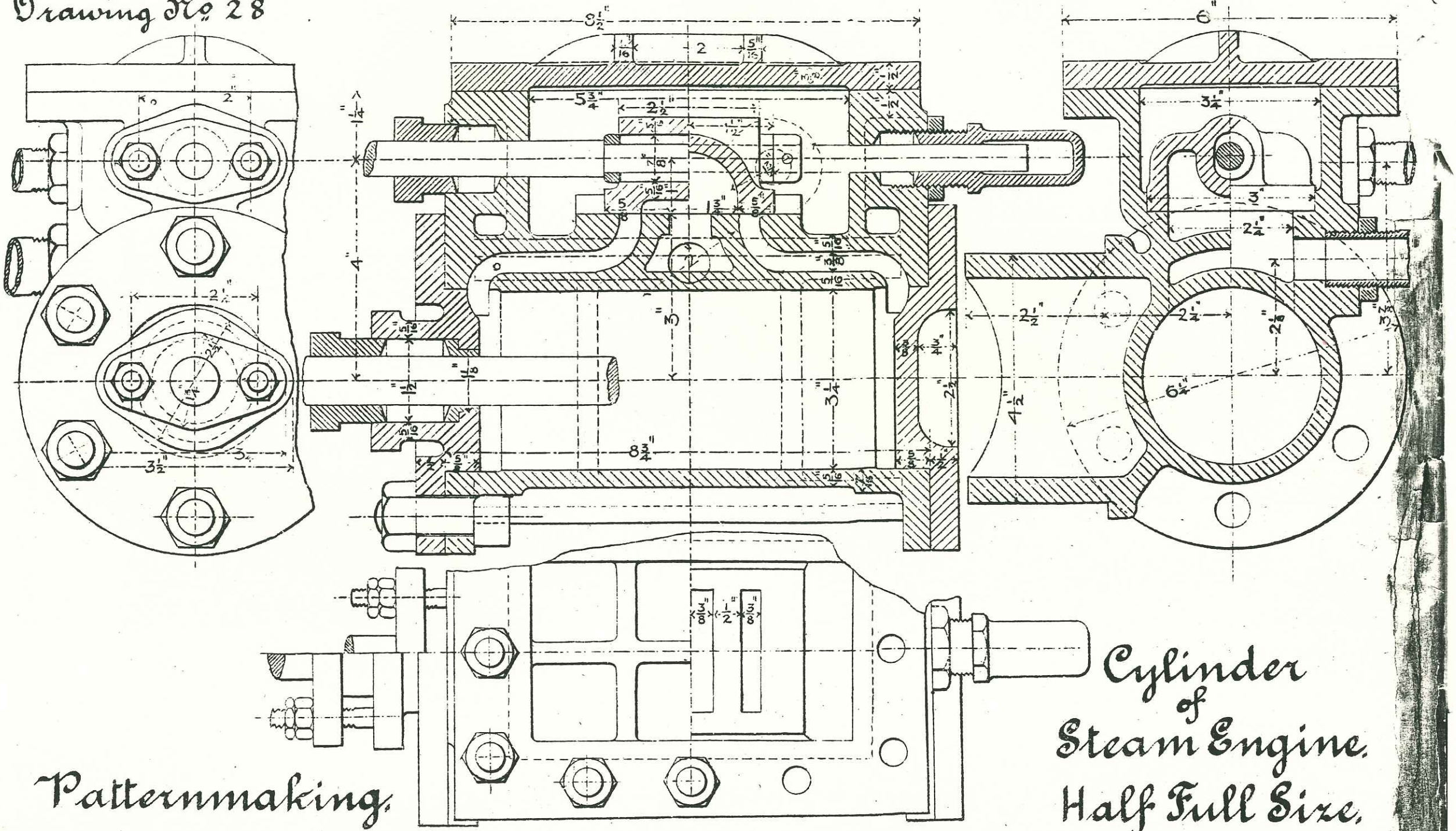




Core-box for Steam Ports.

Cylinder of Steam Engine.
Core Boxes.

Drawing No. 28



Cylinder of Steam Engine. Half Full Size.

Patternmaking.

HANHART LITH.

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